HEDGING

IN ISLAMIC FINANCE

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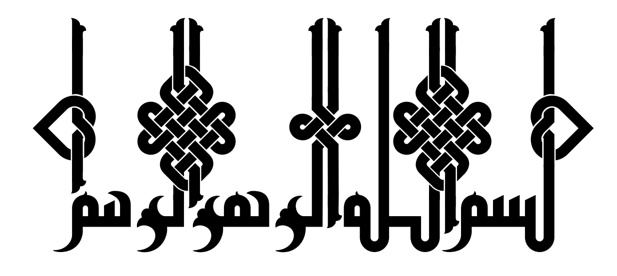
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CONTENTS

FORWARD

Development of Islamic financial products through appropriate processes of financial engineering has remained an important area of research at the Islamic Research and Training Institute since its inception in 1981. Financial product development is also a priority area for the Institute's current and future research.

In this area the Islamic financial industry is facing two competing challenges. Understandably, treasury managers of the Islamic financial institutions face the immediate challenge of managing the financial risks arising from their operations. In order to remain sustainable, these institutions immediately need financial products that can be utilized for hedging against the various financial risks. On the other hand, the industry also needs such financial products that can guarantee the industry's long run viability as a genuinely distinct business model. While the first is an immediate concern of treasury management, the second is also of tremendous importance for the future development of the industry.

The present Occasional Paper on "Hedging in Islamic Finance" by Dr. Sami Al-Suwailem makes an attempt to systematically address the second and more fundamental challenge. This approach is hoped not only to address the future and more vital developmental challenges of the industry, but it is also expected to put the immediate challenges of the institutions in their proper perspective. The research puts the economic analysis of the subject in perspective of the extensive historical literature on Islamic finance and offers premises for developing a number of Islamic financial products for hedging and risk management.

Financial engineering helps in unpacking and decomposition of financial risks that underlie assets in terms of their unique characteristics. Hence financial engineering helps in the development of financial products that can be used to hedge against those specific risks. It is hoped that the present research will promote understanding of the vital subject from the perspective of Islamic finance and motivate other researchers to deal more intensively and in an objective manner with the several ideas presented in the paper. The Institute invites with encouragement such research works from interested scholars.

Bashir Ali Khallat
Acting Director, IRTI

ABSTRACT

The paper suggests several instruments for controlling and reducing risks commonly associated with Islamic contracts. These include risks of capital, rate of return, liquidity, as well as currency risks. Some conventional hedging tools that appear consistent with Islamic principles are also presented.

In the process, the Islamic approach towards risk is surveyed, and strategies for Islamic product development are outlined. Generally speaking, from an Islamic point of view, risk cannot be traded independent from ownership of the underlying asset. Prevailing conventional instruments, in contrast, take the opposite direction. Risk is severed from ownership and thus treated as a commodity in itself. This makes risk management and wealth creation move in different directions, and thus compete for scarce resources. More important, commoditizing risk removes barriers on growth and proliferation of risk, and its distribution becomes distorted against the more willing but less able to bear it.

Islamic hedging instruments avoid these ailments by integrating risk with ownership and thus value-adding activities. This assures the possibility of mutual gain meanwhile reducing and

managing risks. Islamic instruments therefore combine risk management with wealth creation, leading to better performance on both fronts.

Hedging could be also carried out through not-for-profit arrangements. Mutual hedging serves the needs of involved parties in avoiding risks with minimum restrictions. Since it is not for profit, mutual hedging avoids the problems of speculation and increasing systemic risks.

I

INTRODUCTION

Islamic financial industry is growing rapidly. Markets are increasingly appreciating Islamic instruments, and more institutions are willing to provide Islamic services to their clients. Yet, Islamic instruments, particularly in the area of hedging and risk management, are not at pace with the industry's growth.

Islamic financial institutions face a variety of types of risks associated with Islamic modes of investment and finance. The need to address these risks from an Islamic perspective is widely acknowledged in the industry, and has been the subject of several studies, papers, as well as conferences and workshops (e.g. Khan and Ahmed, 2001; IFSB, 2005).

This paper focuses on Islamic instruments for hedging risks associated with Islamic finance. Although not all types of risk are peculiar to Islamic modes, strategies to neutralize and manage such risks are certainly different from conventional approaches.

For this purpose the paper develops a general framework for studying contracting under uncertainty, or *gharar*. This framework then is used as a benchmark against which suggested instruments are evaluated. Along the way, conventional instruments, mainly

derivatives, are discussed. The contrast between the two types of instruments accordingly becomes conceptually clear.

Risk Dilemma

Risk is a challenge in both Islamic as well as conventional finance. On one hand experts and specialists agree that no economic growth can take place without taking risks. "Nothing ventured nothing gained" is the first principle of investment. Further, total absence of risk distorts incentives and hence deteriorates economic efficiency. Thus, risk is inevitable for economic progress. On the other hand, excessive risk will hurdle investment and deter growth. The question then becomes: How to reach a balance between these two ends?

Islamic finance provides a general approach for reaching the answer to this crucial question. When it comes to for-profit transactions, risk cannot be separated from ownership of real goods and services. This is not because risk as such is desirable; in fact, it is exactly the opposite. An effective strategy to minimize and control risk is to have it integrated and embedded in real activities. In this manner, risk becomes naturally controlled by real economy. Meanwhile this would stimulate real activities to generate sufficient wealth in order to compensate for such risks. Since these activities are the driving force for economic growth, the strategy therefore helps achieve two goals at once: creating value and minimizing risk.

Conventional finance provides many tools for managing risk. Some of these are consistent with the Islamic approach, as discussed later in the paper. However, prevailing instruments, namely

derivatives, take the opposite direction: They separate risk from underlying assets. This makes risk management and wealth creation move in different directions, and thus compete for available limited resources. Further, commoditization of risk leads to its proliferation and disproportionate distribution. The final result is higher risks, increasing instability and concentration of wealth. Unfortunately, with exponential growth of derivatives, data show increasing market volatilities, not increasing stability. As discussed later, experts are increasingly aware of these instabilities and the associated costs to real economies.

Message of Islamic Finance

Islamic finance is not only for Muslims. It is for entire humanity: "We have send you solely for the mercy of all worlds" (21:107). This imposes a serious challenge to Muslim economists, namely to successfully deliver the message of Allah (*s.w.t*) to humanity, and positively contribute to world economic stability and prosperity.

Objective of the Paper

The paper's objective is to develop a framework for studying risk and strategies for designing risk management instruments based on Islamic principles and rules of exchange. Several instruments and products are provided as applications to such strategies.

Organization of the Paper

The paper is organized as follows:

Section II reviews volatilities of major financial markets. Data show that volatilities are generally rising. This view is confirmed by leading experts, researchers, as well as policy makers. Despite ingenious risk management tools invented in the last decade, risks appear increasing rather than decreasing.

Section III reviews the ongoing debate on derivatives. Derivatives as such can be used for both risk management as well as pure speculation. The literature shows that derivatives presented a difficult challenge to economists as well as legislators. The legal and economic differences between speculation using derivatives and wagering were and still not resolved. Economic consequences of rising speculation are frequently associated with rising instability.

Section IV presents an Islamic perspective on risk. The section reviews positions of Muslim scholars regarding risk, and that risk as such is not desirable for its own sake; rather, value-creation through real activities is the objective. However, such activities inevitably involve risk. How to distinguish legitimate risk taking from gambling is discussed, and it is shown that the statistical median rule is an effective measure in differentiating the two.

Section V outlines a theory of *gharar*, based on Sharīʿah rules as well as economic reasoning. It is argued that *gharar* is a predominantly zero-sum game, and that this structure distorts incentives and system behavior causing higher risk and instability. The theory is integrated with the Islamic perspective on risk to formulate a general framework

of the subject. This framework is used as a basis for developing Islamic instruments.

Section VI discusses financial engineering from an Islamic standpoint. Principles and strategies for product development are presented and discussed, together with examples from contemporary Islamic financial practices.

Section VII suggests three hedging strategies, each encompassing several instruments. Each instrument is discussed and evaluated. These instruments however are suggestive and are presented to stimulate discussions on the subject rather than as conclusively accepted contracts from Sharīʿah standpoint.

The conclusion is given in section VIII.

Note on References

English references are cited by name and year, while Arabic references are cited by name and number in brackets, e.g. al-Dharir [12], without stating the year. Many references are available on the Internet and thus quotations from such sources are not referenced to page numbers. The web address however is cited in the References section. When the source is simply a web site, the address as well as the date it was visited is given in parentheses, e.g. (investopedia.com; 12.2005).

Acknowledgement

Many ideas presented in the paper have been under development for years. The paper builds on previous research, and

benefited greatly from numerous discussions with colleagues as well as practitioners in Islamic and conventional banks. I find it difficult to recall all their names, but I shall not forget their positive contributions.

My colleagues at IRTI provided numerous suggestions and improvements. In particular, I'd like to thank Dr. Tariqullah Khan, Dr. Habib Ahmed, and Dr. Salman Ali for encouragement and helpful comments. I also thank Dr. Muhammed Tariq, director of the treasury, and Dr. Muddasir Siddiqi, advisor to the legal department, both from IDB Group, for their careful reading and critical comments. Br. Ibrahim Gharbi from IDB Library provided immeasurable support; I greatly appreciate his efforts.

I consider the paper as a work-in-progress. The subject is vastly rich and diverse, and it is beyond the capability of an individual researcher to settle its fundamental complexities. The best the paper hopes for is to point to proper directions for pursuing the subject, and stimulate future research to find answers for the challenging questions. If so, it would be a great achievement and a precious favor from Allah (*s.w.t.*). Otherwise, I hope I don't fail to get a single reward in case the two were missed.

II

State of Risk:
Volatilities of Financial Markets

The past decade witnessed significant financial crises in several parts of the world, including South East Asia, Russia and Latin America, as well as derivatives turmoil of LTCM, financial scandals of Enron, Worldcom, Parmalat, and more recently, Refco.

The detailed documentation of these events would span hundreds of pages (see for example Partnoy, 2003, and Banks, 2004). But there is an apparently general trend of increasing volatility in financial markets that breeds and supports these crises, e.g. Tumpel-Gugerell (2003). In this section we will have a quick look at volatility of selected financial markets to examine this phenomenon.

Stock Markets

While stock markets are generally volatile by nature, over time stock markets are becoming more and more unstable. Figure 1 shows data on the Dow Jones Industrial Average.

There is more than one way to measure volatility. One common measure is the standard deviation. Another measure is number of days for which the gap between high and low values of the

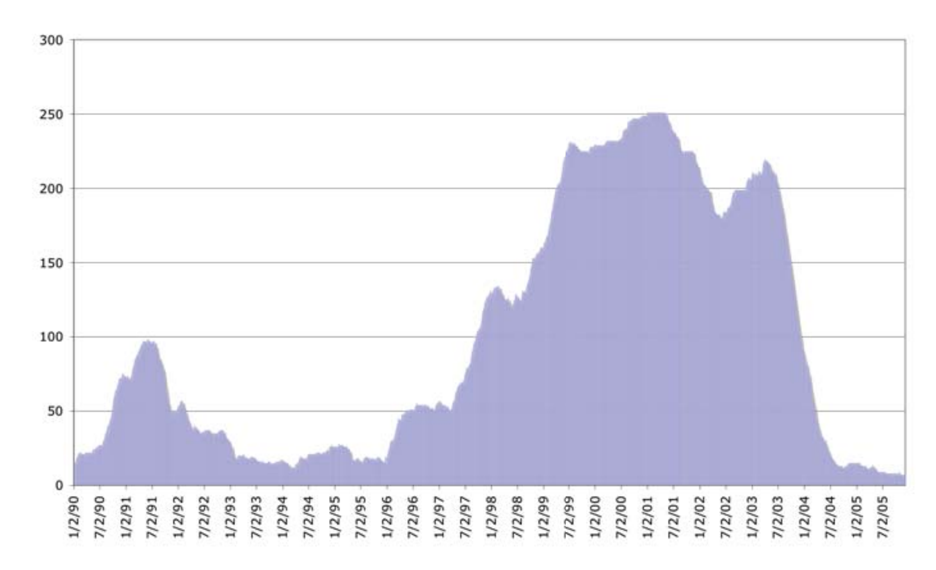


Figure 1: Volatility of the Dow Jones Industrial Average
Source: djindexes.com

index exceeds a certain threshold (e.g. Sornette, 2003). The latter measure is adopted here. To calculate volatility, let

$$u_t = \frac{(high_t - low_t)}{close_t},$$

be the gap between high and low values relative to the close value of the index. Let $\overline{u}$ be the mean of the gap for the sample period. Define

$$d_t = \begin{cases} 1 & \text{if } u_t > \overline{u} \\ 0 & \text{otherwise,} \end{cases}$$

and let $V_n = \sum_{t=1}^{n} d_t$.

Then V_n represents number of days for which the gap exceeds the sample mean. We use a moving version of V, where n equals 252 (number of trading days in the year). This is presented in Figure 1.

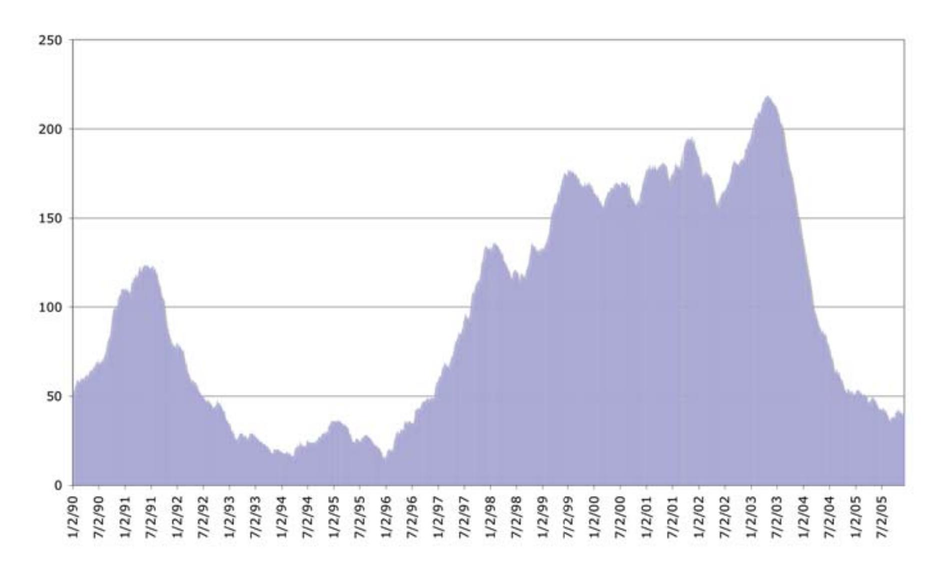


Figure 2: Volatility of S&P 500
Source: finance.yahoo.com

The sample period for the DJ index is January 1, 1990 to December 9, 2005. For the sample period, mean gap $\overline{u}$ is 2.2%.

As it is apparent from the graph in Figure 1, late nineties and early this century witnessed an increasing volatility as compared to early nineties. Average number of volatile days in 2000-2004 is 159 days. In comparison, the average for the period 1990-1994 is 38.6 days. That is, number of volatile days had quadrupled during this period. Volatility however declined during 2005, but we are not certain whether this is a trend or a temporary change.

Figure 2 shows data for the S&P 500 index. Again, the increasing volatility is obvious. Average number of days with high volatility during 1990-1994 is 52. For the period 2000-2004 it is about

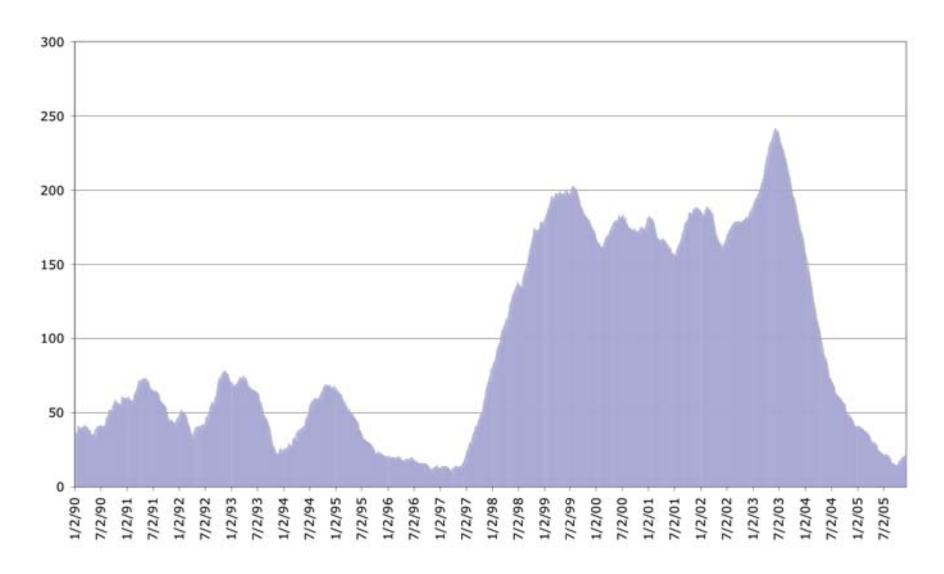


Figure 3: Volatility of FTSE 100
Source: finance.yahoo.com

156 days. Volatility declined for 2005, as in the Dow Jones index, which may or may not be a change in trend.

Figure 3 shows the volatility of FTSE100 index of the largest 100 UK companies listed on London stock exchange. The pattern is close to that of the Dow Jones and S&P 500 indices. Average number of volatile days during 1990-1994 is 53.9, while that for 2000-2004 is 159 days. Volatility also declined for 2005. Future data would help determine the range of this reduction.

Commodities Markets

If we move to commodities markets, we a find a similar pattern. Figure 4 shows volatility in Dow Jones Commodities Index (DG-AIGCI). The index represents rolling futures on 19 commodities.

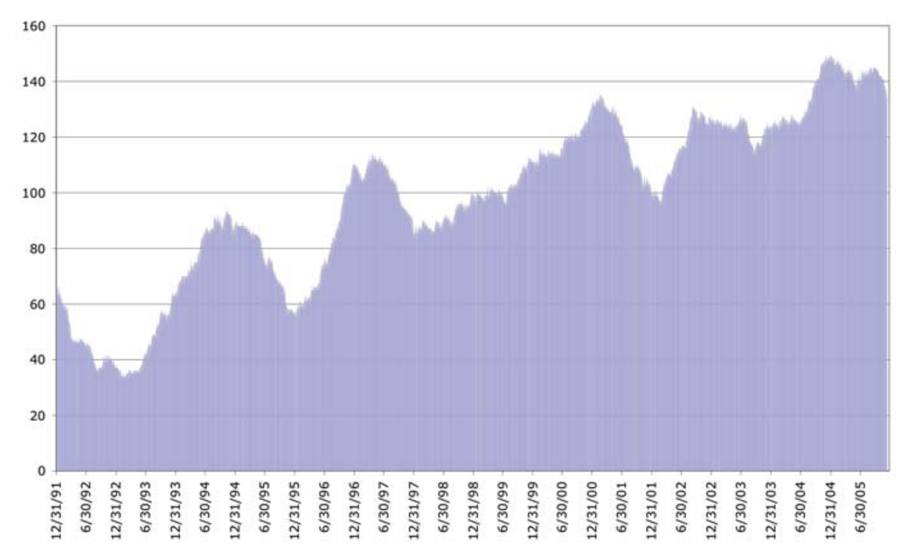


Figure 4: Volatility of DJ Commodities Index
Source: djindexes.com

These include: Energy commodities (33%), grains (18.4%), vegetable oil (2.7%), livestock (10.5%), precious metals (8%), industrial metals (18.2%), softs (9.2%).

Figure 4 shows number of days for which absolute change in daily price compared to the previous day exceeds average change of the sample (0.57%). The number represents the sum of days for the past year (252 days). The increase in volatility over the past 15 years is substantial. This might be affected by the Iraq war and its impact on oil prices. But the rise in volatility started much earlier than that, as the graph shows.

Average volatile days per year in the period 1991-1994 are 57 days. For the period 2001-2004 it is 123.

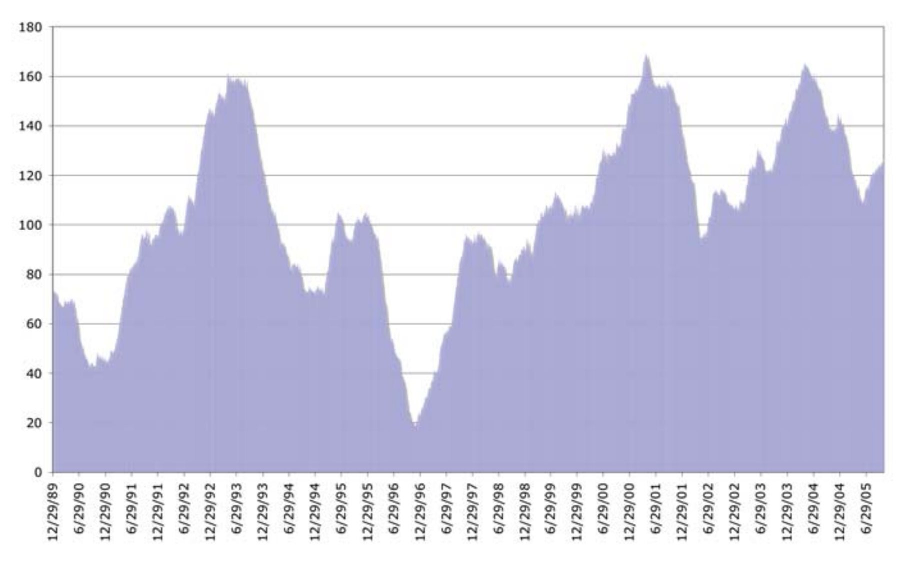


Figure 5: Volatility of USD Index
Source: nybot.com

Currencies Markets

Figure 5 shows volatility in the exchange rate of a basket of currencies against the US Dollar, based on the index developed by New York Board of Trade (USDX, nybot.com). The index is composed of Euro (57.6%), Yen (13.6%), British Pound (11.9%), Canadian Dollar (9.1%), Sweden Krona (4.2%), and Swiss Franc (3.6%).

The figure shows number of days for which High-Low difference of the USDX as a percentage of Close exceeds the average difference of the period (about 0.73%). The sum runs through 365 days per year, as the currency market is open around the clock.

Overall, the USDX appears somehow more volatile from 1997 and on than before. Average number of volatile days per year in 1990-1994 is 106.5, while that for the period 2000-2004 is 134, which is

more than 26% increase in volatility. The medians for the two periods are 100.5 and 138, respectively, which represents about 38% difference.

The following Table summarizes the above results.

Table 1

Volatilities of Selected Markets

	1990-1994		**2000-2004**	
	mean	*median*	*mean*	*median*
DJIA	38.6	27	159.4	199
S&P 500	52.1	36	156	176
FTSE 100	53.9	57	158.9	174
DJ Commodities index*	57	52	123	124
USD index	106.5	100.5	134.4	138

* Sample starts from 1991. Figures shown are for 1991-1994, 2001-2004, respectively. Gap is measured by percentage change in price.

Stability of Financial Markets

Table 1 shows a remarkable increase in volatilities in the past decade. Markets volatilities increased by an average of 225%. Many writers recognized this phenomenon. As early as 1996, Bernstein pointed that "volatilities seems to be proliferating rather than diminishing" (p. 329). The Asian crises and other episodes of the nineties made Paul Krugman (1999) write: "The world economy has turned out to be a much dangerous place than we imagined" (p. 154). More recently, Gertrude Tumpel-Gugerell (2003), member of the

Executive Board of the European Central Bank, argues that since 1997, volatility of leading stock markets has doubled, and that this doubling was the result of a slow but steady rising trend. Nobel laureate Joseph Stiglitz (2003, p. 54) concludes that: "Something is wrong with the global financial system."

There are many factors that contributed to this increasing volatility, and it would not be at all an easy task to pinpoint all these factors. We shall focus instead on the most common tools used to address volatility: derivatives.

III

DERIVATIVES

Derivatives can be described as financial instruments for trading risk. The most common of which includes futures, options, and swaps. Theoretically, derivatives are supposed to distribute risk among market participants in accordance with their ability to assume them. If such distribution is achieved, each party would be better off, thus improving efficiency and productivity. Derivatives are thus the main instruments used conventionally to hedge various types of risk. But they are also the main instruments for speculation. How to balance the two functions is a major challenge to economists and legal scholars alike.

Given the two sides of derivatives, we will briefly discuss how economists and specialists view the issue, leaving the Islamic perspective to Section V.

Structure of Derivatives

Derivatives are generally zero-sum exchanges between two parties. According to former Federal Reserve Chairman, Alan Greenspan (1999): "Overall, derivatives are mainly a zero-sum game: one counterparty's market loss is the other counterparty's market

gain" (see also Group of Thirty, 1994, p. 64). Options and futures are examples of zero-sum games, since for every party who gains the counter-party loses (investopedia.com; 12.2005).

As such, derivatives are not "real" transactions since no transfer of ownership takes place. Only money changes hands at the end of the contract. Delivery of underlying assets is very rare; in futures, for example, 99% of all contracts are settled before maturity (Pilbeam, 2005). For this reason, the Financial Services Authority of the UK defines derivatives as "contract for differences" (Swan, 2000, p. 11). That is, they are settled through price differences without delivery or ownership transfer. We will see later how this feature affects the risk structure of derivatives.

It should be emphasized that contracts that transfer ownership and explicitly involve delivery of the underlying are not considered derivatives, and thus are excluded from subsequent discussions. Further, spot trading of shares or other assets is not a zero-sum game as such, since profits and losses are not debited from one party and credited to the other, as it is the case in derivatives. Moreover, trading implies the transfer of ownership, which does not take place in derivatives. This is further explained in section V.

Size of Derivatives Market

Derivatives can be traded generally in one of two markets: Organized exchanges (OE), and over-the-counter (OTC). Organized exchanges, like Chicago Board of Options Exchange (CBOE), are regulated and centralized markets for standardized derivatives. Over-

the-counter are decentralized, less regulated markets for less standardized derivatives.

Data collected by the Bank of International Settlement shows that derivatives have been growing at a remarkable rate. Figure 6 shows size of the two markets based on BIS data.

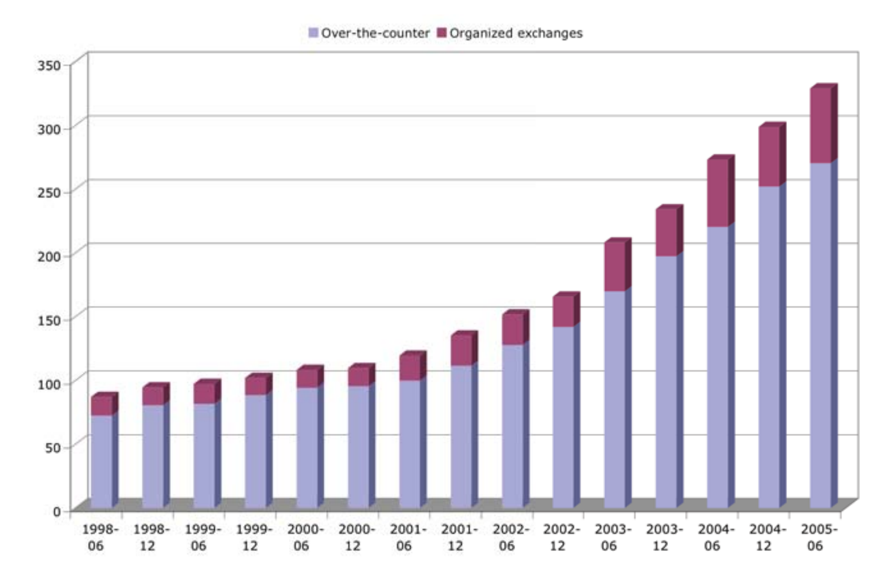


Figure 6: Notional Values of Derivatives
Source: bis.org

The notional amount represents the value of the underlying asset from which the derivative is derived. Total notional amount of derivatives today reaches $330 trillions, up from less than $100 trillions in 1998. That is, derivatives more than tripled in less than 7 years. In 1986, OE derivatives were about $614 billions. In two decades the derivatives markets overall grew by a factor of more than 300. This exceeds the growth rate of any type of securities or assets in world economy.

Futures

"Futures" refer to standardized tradable forward contracts. Forwards, in turn, represent an agreement to deliver a defined commodity in a future date for a determined price. Forwards as such are common to human economic activities, so they are not new. Tradable forwards were known since the time of Imam Mālik (179H, circa 800G) in Madinah, where *salam* (forwards) contracts where allowed by the Māliki school to be traded in a secondary market (e.g. al-Dharir [12]). However, forwards involving essential food commodities (wheat, barely, dates and salt) were not allowed to be traded in a secondary market, following the instruction of the Prophet (peace be upon him) that food cannot be sold without being possessed in advance. In other words, tradable forwards in principle were known and established more than 1200 years ago.

But these futures differ from contemporary futures in two fundamental aspects: advanced payment and delivery. In all *salam* contracts, the full price must be paid in advance. Further, the underlying commodity must be delivered at maturity, and there are several restrictions on subsequent canceling and settling of the contract without delivery. These two sets of conditions prevented the contract from being used for pure speculative purposes, whereby it ends up in exchanging money for money, a result that Muslim scholars unanimously consider to be void and null.

Organized futures, where most contracts end up in settling price differences, are relatively recent phenomenon. The first such

organized market was probably established in Japan in 1730 (Teweles and Jones 1987, p. 8), where no delivery would take place.

In 1848 the Chicago Board of Trade established the first organized futures exchange in the West. In the beginning, however, it was an exchange of forwards, i.e. commodities with future delivery. Only in 1865 where futures started trading (see: cbot.com; 12.2005). In 1877 futures trading became more formalized, and "speculators" would be recognized as market players (*ibid*). Subsequently, the futures market grew in size, and other exchanges introduced futures trading (Teweles and Jones, 1987).

Today, futures are traded for all kinds of assets: equities, bonds, currencies, interest rates, indices, volatilities, etc.

Options

In its basic form, the idea of a stipulated sale with penalty is quite old. *ʿUrbūn* was one such contract, where the buyer would pay a down-payment with the condition that, if he cancels the contract, he would lose his down-payment. It was known since the time of the second Caliph ʿOmar ibn al-Khaṭṭāb (22H, circa 700G) (al-Dharir [12]). However, as such it was not used for speculation, i.e. fixing current price to benefit from future price movements, but for real trade transactions; i.e. they were "real options" (see al-Suwailem, 1999).

Options were actively traded in Amsterdam in the seventeenth century. In the U.S., options appeared in the same time as stocks, the early nineteenth century (Sullivan, 2005). In addition to speculation,

put-call parity was used in mid 1800s to advance loans for much higher interest rate than allowed by usury laws (Chance, 1995). Option trading, however, remained limited until Black, Merton and Scholes published their formula for pricing (stock) options in 1973. At the same year, Chicago Board of Options Exchange was founded after years of study and planning (cboe.com, 12.2005; Sullivan, 2005), where call options started to be traded. Put options had to wait until 1977, with careful monitoring by SEC (Sullivan, 2005).

Other forms of derivatives, e.g. swaps, short-selling, etc., have their own histories, which go beyond the scope of this paper.

Struggle for Legitimacy

Since its early appearance around the middle of the nineteenth century, derivatives, mainly futures and options, were subject of prolonged and intense discussions on whether they were legitimate business and trading instruments or merely gambling tools. According to legal scholar Roy Kreitner (2000), "at common law it was accepted that transactions for future delivery of property, including stocks and commodities, in which the parties did not intend actual delivery, but rather only settlement according to price differences, were unenforceable because they were mere wagers" (p. 1103). This made courts in many instances not sympathetic to these contracts. In one case in 1888, the court expresses it opinion as follows:

> We are clearly of opinion that dealing in "futures" or "options," as they are commonly called, to be settled according to the fluctuations of the market, is void by the common law; for, among other reasons, it is contrary to

> public policy. It is … a crime – a crime against the state, a crime against the general welfare and happiness of the people, a crime against religion and morality, and a crime against all legitimate trade and business.
>
> This species of gambling has become emphatically and pre-eminently the national sin. … Clothed with respectability, and entrenched behind wealth and power, it submits to no restraint, and defies alike the laws of God and man. … Through its instrumentality the laws of supply and demand have been reversed, and the market is ruled by the amount of money its manipulators can bring to bear upon it. (Kreitner, 2000, p.1110.)

Although not all courts were of this position, as Kreitner points out, the general trend in the first half of the nineteenth century was in this direction (Swan, 2000, p. 219).

A critical difference between a legitimate future contract and a wager was delivery of the promised commodity. Courts frequently used the "intent test" to decide whether the parties intended to deliver, and thus the transaction was enforceable, or intended to settle in differences, whereby the transaction was a wager (Kreitner, 2000; Swan, 2000, pp. 212, 219).

There were many attempts to have the Congress illegalize futures and options, backed mainly by farmers and their supporters (Freeman, 1993; Saber, 1999*b*, pp. 201-202; Swan, 2002, pp. 217, 245; Santos, 2004). In 1890, a Congressman expressed the opposition to derivatives:

> Those who deal in "options" and "futures" contracts, which is merely gambling, no matter by what less offensive name such transactions be designated, neither add to the supply nor increase the demand for consumption, nor do they accomplish any useful purpose by their calling; but on the contrary, they speculate in fictitious products. The

> wheat they buy and sell is known as "wind wheat" and doubtless for the reason that it is invisible, intangible, and felt or realized only in the terrible force it exerts in destroying the farming industry of the country. (Teweles and Jones 1987, p. 11.)

More recently, in 1993 representative Henry Gonzalez, chairman of House Banking Committee, described derivatives trading saying: "You can call it whatever you want, but in my book it is gambling" (Steinherr, 2000, p. 151).

Several US states at some point in time did prohibit dealing in options and futures. According to Santos (2004), the Illinois constitution in 1867 forbade dealing in futures, but this was repealed by 1869. In 1879 California's constitution invalidated futures, but was repealed in 1908. In early 1880s, Mississippi, Arkansas and Texas passed laws that equated futures trading with gambling, thus making futures trading a misdemeanor. Options on agricultural commodities were outlawed on most exchanges (*ibid*), and were not officially legalized until 1983 (Freeman, 1993). Despite repeated attempts to illegalize futures, all failed except one: in 1958 the Congress passed a bill to prohibit futures trading in onions (Teweles and Jones, 1987).

It is worth noting that the legality of futures is related to organized exchanges. According to Kreitner (2000), "Private individuals cannot create enforceable contracts with one another for futures, unless they actually intend delivery" (ftn. 28).

This legal transition apparently affected the laws of some Muslim countries early past century. The Egyptian law used to classify futures as wagering until 1909, when the law made futures traded in

organized exchange as legal (al-Dharir [12]; pp. 619-620). The law however confines this exception to organized exchanges, so that any forward contract settled through price differences outside the exchange is still considered void (*ibid*).

Economic Debate

The debate wasn't confined to legislative circles. Economists and investors were also involved. Many economists believe that markets, in principle, are efficient, and therefore whatever market players agree to trade would serve their needs and consequently the social good. This is the prevailing view, and expressed most notably by economists like Merton Miller and others who generally accept the efficient market hypothesis (see e.g. Financial Economists Roundtable, 1994).

On the other hand, many mainstream economists and investors express concerns about the behavior of financial markets in general, which extends naturally to derivatives, as the most important tools for speculation. Keynes (1936) was among early economists who expressed dissatisfaction with gambling-like financial market:

> Speculators may do no harm as bubbles on a steady stream of enterprise. But the position is serious when enterprise becomes the bubble on a whirlpool of speculation. When the capital development of a country becomes the by-product of the activities of a casino, the job is likely to be ill-done (p. 159).

About 70 years later, Noble laureate M. Allais (1993) describes such markets as "casinos where gigantic games of poker are played" (p. 35).

While acknowledges the value of forward arrangements for hedging, particularly for real goods and commodities, Allais questions the value of forwards on securities, like stocks and bonds (p. 37). Further, he explicitly states, "speculation on security price indices must be eliminated" (*ibid*).

On the business front, Warren Buffet, one of the most successful investors and Columbia University graduate, takes a strong position against derivatives. In his letter to shareholders he describes derivatives as "time bombs, both for the parties that deal in them and the economic system" (p. 13). Further, Buffet argues that derivatives can exacerbate the risks at the firm's level and at market level, and that the "macro picture is dangerous and getting more so" (p. 14). He concludes the discussion stating that: "In our view, however, derivatives are financial weapons of mass destruction, carrying dangers that, while now latent, are potentially lethal" (Buffet, 2002, p. 15).

General Electric, one of the largest corporations in the U.S., is involved in financial business through its subsidiary, GE Capital (GECS), which owns more assets than most U.S. banks. GE's position regarding derivatives is summarized in its 2001 annual report: "As a matter of policy, neither GE nor GECS engages in derivatives trading, derivatives market-making, or other speculative activities" (cited in Partnoy, 2003, p. 380).

Derivatives and Risk

Proponents of derivatives argue that these instruments can efficiently distribute risks among involved parties, such that agents

become more productive and the economy more prosperous. The classical example cited is of a producer (of agricultural commodities or energy products) who is uncertain of future prices. He can hedge against this uncertainty using futures, thus real production may not be hindered by uncertainty. The counterparty to such contract would be one who is more able to take price risks, and this is the speculator. Thus, for every hedger, there is a speculator. This transfer of risk from hedgers (real producers) to speculators is supposed to improve efficiency and productivity of the economy. In other words, derivatives manage risks but do not create them (Spence, 1997).

Critics, however, point to aspects that this reasoning ignores:

Willingness vs. Ability to Take Risks

One aspect is that risk can be traded and "unbundled" only if it's severed from the underlying activity. This separation raises the question of the ability of traders to manage these risks. For example, credit default swaps allow banks to transfer the risk of default of borrowers to other parties like insurance companies. But banks by design are better able to monitor borrowers and uniquely have the access to necessary related data. Insurance companies are less able to manage these loans and thus to assume these risks (Partnoy, 2003, pp. 380-381). This is reinforced by the mounting evidence of prevailing informational asymmetries and other imperfections in capital markets. These asymmetries make it costly to third parties to perform the same functions as the owners of original assets, and thus performance and pricing might be distorted significantly. Unbundling of risks therefore

is built on the assumption of perfect markets with full and symmetric information, which modern information theory has shown to be largely inconsistent with reality. In 2001, George Akerlof, Michael Spence and Joseph Stiglitz were awarded Nobel prize for their work on information economics. In his Nobel lecture, Stiglitz (2001) explains how his direct experience conflicted with economic models he was taught 40 years ago. His subsequent research, as well as that of many prominent economists, has shown how information changes the way agents behave, and thus significantly affects market equilibrium. The assumption therefore that risk can be traded separately is simply inconsistent with large evidence that this cannot produce efficient results. Lenders are better able to monitor their borrowers, and thus to minimize their risks. Once this specific relationship is severed, risks are likely to develop rather than be controlled.

Derivatives markets allow risk to be transferred to those more *willing* to take them, but not necessarily those who are more *able* to manage them. Greenspan (2002) implicitly points to the difference: "The development of our paradigms for containing risk has emphasized dispersion of risk to those willing, and *presumably* able, to bear it" (emphasis added). This presumption, however, is not necessarily warranted, as these two concepts are independent. There are certainly many speculators who are more willing to take risks but are less able to bear them. This is particularly the case for low net-worth, cash-constrained agents who might be more willing to take risks if they are paid upfront, even though they are less able to bear such risks. They gain needed cash for certain, but have less to lose if they

fail. This is the classical adverse selection problem that arises in relation to imperfections and asymmetric information. Consequently, the system might end up allocating risks to those *least able* to bear them, but are the *most willing* to take them. As will be pointed later, this in fact might be the case.

Commoditizing Risk

Derivatives unbundle risk from real economic activity and make it traded separately, thereby transform risk into a "commodity" (Steinherr, 2000, p. 101). Since risk as such is not desirable—in fact, harmful—it becomes a "bad" not a "good" commodity, just like toxic waste. From a social point of view, risk shall be minimized, not promoted. Creating a market for risk, however, raises serious questions on whether this would reduce risk or make it multiply. Since market players seek profits, some players, particularly speculators, will be better off if the market grows and expands. Speculation through derivatives thrives on a growing market of risk, while producers and consumers are better off if risk is minimized. The tension between the two reflects the zero-sum nature of derivatives. Commoditizing risk therefore is likely to make risk multiply and proliferate, making the economy more risky and less stable. Moreover, just as toxic waste might frequently end up buried in poor and less developed countries, risk might end up born and suffered by poor and less developed countries, with Asian and Latin American crises as clear examples. The same applies with respect to individuals in a given country, where ordinary people and taxpayers end up paying the real costs of

speculation (e.g. Steinherr, 2000, p. 91). Thus, commoditizing risk not only makes it proliferate, but also disproportionately distributed.

Artificial Risks

Derivatives allow for unbundling and repackaging risks in any manner players find suitable for their preferences. But this feature means that these instruments end up with risk-reward structures that differ greatly from those of the underlying real assets (Tumpel-Gugerell, 2003). This production of artificial risk profiles creates arbitrage opportunities that are independent of real opportunities, which opens the door to pure speculation to take advantage of these artificial structures. Thus, as Tumpel-Gugerell (2003) rightly points out, players are given, and frequently make use of, the opportunities of pure speculative positions that are not related nor offered by the real economy. In other words, artificial risk structures create artificial arbitrage opportunities that can be exploited through pure speculation with no connection to real economic activities. Pure speculation in turn distorts assets prices, leading to negative impacts on real investment opportunities. Consequently, capital committed to such speculation becomes exposed to risks unrelated to the real economy. Not only these risks are reflected back to the economy, they also distort asset prices, leading to negative impacts on real investment opportunities.

Severance of Risk

Derivatives by construction separate and sever risk from ownership and thus from real activities, as discussed above. Once risk is separated from the real sector, there is no boundary on kinds of risk traders may bet on, be it the rating of some selected companies, the completion of a certain takeover, the weather in New York city, or any other imaginable risk (e.g. Buffet, 2002). In addition, a derivative could be derived from another derivative, not a real asset. Thus there are options on futures, futures on options, options on options (Saber, 1999*b*, p. 122), etc. And all these compounded derivatives could be based on market indices or volatilities, where no ownership of any sort exists. This shows how derivatives diverge away from real activities when they are severed from each other. Accordingly, their size and growth move independent of the real sector. Since the real economy is naturally more complex and is subject to more constraints than the abstract world of risk, derivatives markets grow at a higher rate than do real assets (LiPuma and Lee, 2005; Chorafas, 2003, p. 144). Given the size of real resources committed to this huge market, derivatives therefore expose real resources to risks that could have been avoided in the first place.

From this perspective, derivatives make the economy more risky. As Lawrence Summers (1989) points out: "The freeing of financial markets to pursue their casino instincts heightens the odds of crises. … Because, unlike a casino, the financial markets are inextricably linked with the world outside, the real economy pays the price" (al-Yousef, 2005, p. 83).

Risk and Time

Severance of risk in many aspects is similar to severance of time from real transactions. Time and risk are highly inter-related, and they are in fact two sides of the same coin (Bernstein, 1996, p. 15). Severance of risk eventually leads to greater risks and higher costs of risk management, as discussed earlier. The same happens when time is separated from real transactions through interest-based lending. This results in increasing levels of debt and thus higher costs of financing through higher costs of debt services.

Just as interest accumulates and compounds on past debts leading to enormous divergence of finance from real activities, derivatives similarly compound and multiply farther and farther from real activities. And just as compounded interest costs the economy much more than costs of real finance, derivatives cost the economy much more than costs of real risks. Not surprisingly, interest-based debt has been considered a major factor in facilitating speculation and thus contributing to financial crises (Chapra, 2004).

Market Distribution

The argument that severance of risk increases speculation is supported by data on the distribution of market players. Number of speculators in derivatives markets far exceeds that of hedgers. Data also show that derivatives markets are highly concentrated in few major banks, and most trading takes place among these banks.

According to Office of Comptroller of the Currency (OCC), only five commercial banks account for 96% of total notional amount

of derivatives in the commercial banking system in the U.S. Further, only 2.7% of total derivatives are used by end users, i.e. corporations assumed to hedge their risks, while the remaining 97.3% is used by dealers (OCC, 2005). And according to the Bundesbank (2003), "less than 10% of OTC transactions in derivatives is conducted with end customers outside the financial sector" (p. 37). This shows that end users, and thus hedgers, are minorities in the derivatives market. Speculators dominate the market.

Furthermore, according to Group of Thirty (1997), these institutions dominating the market tend not just be each other's counterparties, but also to have extensive dealings with many of the same customers, and be members of the same clearing houses and exchanges. According to Tumpel-Gugerell (2003):

> This results in a random, zero-sum, large volume redistribution of wealth which affects all types of market participant, including those whose motivation was to invest in the real economy.

Further, the concentration of risks contributes to economic instability, because if any of these large institutions get into difficulty the contagion effect would be more serious and far reaching (Steinherr, 2000, pp. 190-193; Tickell, 2000, p. 91). The end result therefore is that derivatives markets concentrate risks instead of diluting them, and thus add to market instability rather than reduce it.

Law of Large Numbers

The large number of speculators, it may be argued, helps diversify and neutralize the risks they are bearing and thus helps provide liquidity to the market. This could be true as long as these risks are independent, as the law of large numbers requires. But if this is not the case, risks might compound. Nobel laureate Kenneth Arrow (1971) points to specialization of speculators to assume risks. He explains:

> This specialization is a social gain, both because speculators normally have greater knowledge of the uncertainties than the average individual and because of the operation of the law of large numbers. However, if the speculators' forecasts tend to be interdependent, this law, which depends upon the independence of the random events consolidated, may be inoperative and *the situation may actually be worse than without speculation*. (p. 24, emphasis added.)

Whether risks are independent or interlinked cannot be determined by pure theory. Only history can give indications of the answer. Observers generally agree that world markets are becoming more and more interlinked. Asian crisis in 1997 and Russian crisis in 1998 each had measurable impacts on Western markets. Derivatives by design tend to interlink markets in increasingly unpredictable manners (Steinherr, 2000, p. 158; Tickell, 2000, p. 90). The collapse of Long Term Capital Management fund shows clearly how markets can suddenly move in lockstep and away from "convergence" (Lowenstein, 2000, p. 144; Partnoy, 2003, p. 259).

Consequently, risks of derivatives markets cannot be considered independent. This is confirmed by "herding behavior," i.e. investors mimicking each other in the market. This behavior stems from a variety of informational and psychological factors, and leads to bubbles and crashes that cannot be accounted for by fundamentals (Shiller, 2000; Sornette, 2003). Accordingly, speculators' behavior cannot be totally independent, and possibilities for unison movements are highly likely. This raises concerns that speculators end up exacerbating market risks rather than reducing them, as Arrow pointed out.

Systemic Risk

Advocates of derivatives argue that derivatives cannot make the economy more risky since they are zero-sum trades, as mentioned earlier. This implies that what one party loses is essentially what the other party gains. There cannot be a net loss, and thus derivatives cannot make the system worse off (Slutz, 2004).

Critics, in contrast, point that this argument does not take into account how zero-sum transactions affect aggregate variables. Economic activities, particularly if leveraged, create a web of financial relations among market participants. These relations interlink agents with each other, such that the collapse of one agent would likely affect many other agents beyond those with immediate contact. These links make the market more efficient but at the same time more vulnerable to external shocks.

Positive-sum activities naturally create additional wealth. This additional wealth would balance the additional risks created through inter-linking of agents. In normal circumstance, the additional wealth might well more than offset the additional risks. Consequently, the economy becomes more efficient *and* more stable.

In contrast, a market of zero-sum transactions by design does not create additional wealth to balance the additional risks created through inter-linking of agents. The system creates risks without generating wealth to balance them. What starts as zero-sum at the micro-level, ends up to be negative-sum at the macro-level. (More on risk and zero-sum structure in section IV.)

These arguments for systemic risks of derivatives are supported by the realities of the markets. When the hedge fund Long Term Capital Management (LCTM) was near collapse in 1998, with assets exceeding $100 billions and more than $1 trillion in derivatives, the Federal Reserve had to intervene to prevent a potential financial crisis. According to Federal Reserve authorities, the failure could have triggered the "worst financial crisis in half a century," and that the sudden liquidation of the fund in already unsettled markets "could well have induced further financial dislocations around the world that could have impaired the economies of many nations, including that of the United States" (Partnoy, 2003, p. 261). This clearly shows how derivatives may impair entire economies, as large as that of the U.S.

Derivatives therefore might well make economies more volatile and unstable. According to Bernstein (1996), despite the "ingenious" tools created to manage risks, "volatilities seems to be proliferating

rather than diminishing" (p. 329). The data presented in the past section show clearly that markets are becoming increasingly volatile. If any thing, this shows that, overall, contribution of derivatives to stability is questionable. Alfred Steinherr (2000), general manager of the European Investment Bank, goes even farther:

> Recent financial history provides ample evidence that the growth of derivatives markets has made financial crises considerably more virulent, and the fast growth and widespread use of derivatives has increased the risk of financial disturbance (p. 177).

The Two Edges of Derivatives

It is important to note that a derivative can be used for both hedging and speculation alike. Intention does not impose any structural difference on the used instrument. Consequently, a company using a derivative for hedging might end up speculating, as the nature of the instrument is identical for both uses (Saber, 1999*a*, p. 111). Kenneth Arrow (2003) notes that "derivatives and securities that offer methods of reducing risks are not necessarily used for that purpose. They are neutral and can be used to reduce risks, but people gamble on them." He adds: "That means speculators are adding to the swings rather than reducing them." Tumpel-Gugerell (2003) also notes that: "It is impossible to distinguish between speculative positions that are, in essence, bets, and positions that are triggered by the resources allocation process of the real economy."

Accordingly, risk trading may divert corporations from their real business to pure speculation, exposing real capital to major risks totally unrelated to their normal business. This happened to a long list of companies, see e.g. Bernstein (1996) and Partnoy (2003). As some writers put it, "It seems that most farmers start speculating two years or so of hedging" (Chance, 2003). Incentives to make money are sufficiently strong that more than 97% of derivatives are used for speculation. In this sense, derivatives are not really neutral.

Limits to Derivatives' Protection

It should be noted that derivatives are not risk free. They are obligations, and as with any obligation, they carry their own risks: counter party risk, operational risk, legal risk, etc. (e.g. Banks, 2004).

Further, derivatives contracts commonly include a *force majeure* clause that permits the parties to the contract to terminate it without performance if an event occurs that has a pervasive effect on markets (Steinherr, 2000, pp. 181, 89). This apparently explains why hedge contracts did not help when Russia devalued its ruble and declared a moratorium on its ruble-denominated treasury debt in 1998. Investors faced huge losses despite their hedging contracts against the ruble. The crisis caused a "flight to quality" since traditional hedge instruments did not help. This eventually led to the collapse of Long Term Capital Management fund, which threatened the global financial system (Lowenstein, 2000). According to Steinherr (2000), "hedges may evaporate in situations of severe market disruptions" (p. 199).

Derivatives can be used to hedge specific risks, but it is rarely possible to hedge every risk. According to Allan Kessler, vice president of J.P. Morgan of foreign exchange, "There isn't a company on earth that has 100% hedging program" (Sparks, 2000). One example is the case of the US subsidiary of Metallgessellschaft (MGRM). The forward program of MGRM, although serves as a textbook hedge model, caused huge losses to the company, which forced its board to liquidate and close all its positions. Although the decision was controversial, it was clear that a hedge strategy cannot be perfect, and MGRM was not able to hedge all risks (Steinherr, 2000, p. 68).

Since derivatives are marked to market, losses and gains on derivatives have to be settled in cash daily, while overall value of the hedge appears only at maturity. This means that for a hedge to be effective, the agent has to be able to sustain short-term losses for a prolonged period of time (*ibid*). If the agent has no sufficient funds, the hedge fails. This also was one reason behind the collapse of LTCM, where the fund was unable to survive short-term losses because of lack of sufficient liquidity (Lowenstein, 2000).

Derivatives are designed to deal only with known risks, approximated with past performance and behavior. As Steinherr (2000) points out: "The most important, and typically rare, future events are most likely to be totally unanticipated today. Therefore there is no hedge for them" (p. 104). Together with the *force majeure* clause, derivatives' hedging appears like an umbrella that works well when the weather is clear, but fails when it rains.

We shall see later that other strategies for hedging provide better design and lower costs than derivatives do.

Who Ultimately Bears the Risk?

Derivatives are highly leveraged by construction, as Greenspan (2003) notes. This leverage makes the financial system highly vulnerable. Greenspan makes it clear that managing the risks of such a system "will not lie with the private sector alone." He explains:

> Leveraging always carries with it the remote possibility of a chain reaction, a cascading sequence of defaults that will culminate in financial implosion if it proceeds unchecked. Only a central bank, with its unlimited power to create money, can with a high probability thwart such a process before it becomes destructive.

He thus points out that the burden of risk of extreme outcomes will be "allocated between the public and private sectors." In other words, governments are the ones who eventually bear the risks of speculators. According to Stiglitz (2002), speculators do not make money from each other, as this is a highly risky activity that on average makes a zero return. "What makes speculation profitable is the money coming from governments" (p. 198). Greenspan admits the negative consequences of such intervention, mainly moral hazard that might make the system even riskier (Lowenstein, 2000, p. 230).

The resulting allocation of risks of derivatives between private and public sectors is rightly described as a system where 'profits are privatized, but losses are nationalized' (Stiglitz, 2002, p. 209; Chorafas, 2003, p. 135). The system rewards speculators but punishes

ordinary persons and businesses that were supposed to transfer their risks to those same speculators. Instead of speculators bearing the risks of ordinary agents (hedgers), the system makes hedgers eventually bear the much greater risks of speculators. Steinherr (2000, p. 120) points to costs of derivatives and who in fact pays them:

> As for an individual, so also for society, nothing comes for free. Yes, derivatives are a great social advance. The cost is much increased volatility, more frequent and vicious crises, less scope for government intervention. A price worth paying, probably, but still quite high. The major winners are those selling derivatives and many users. Those who pay [the price] are all market participants hit in a crash.

Winner and Losers in Derivatives

Recall that a derivative is a zero-sum trade, and thus for each contract there is a winner and a loser. There have many studies conducted on some derivatives that examine numbers of winner and losers, particularly among end users.

One early study was by Hieronymus (1977), who examined 462 speculative accounts of a major futures brokerage firm. For less-regular traders (beginners), they lost 92% of the time. Among regular futures traders, he found that 41% made profits, while 59% lost. Overall the market showed its zero-sum nature, as net profits for the whole group were almost zero.

Teweles and Jones (1987) review several studies with similar results, and present their own. They examined about 4600 accounts of a large brokerage firm for 10 years starting 1962. The results "confirm

that the average expectation of a trader making net profits in any given year will be one in four" (p. 319). To make profits consistently over several years, the probability drops significantly. The authors estimate that, from the 25% who win in any given year, only 2% can consistently win (p. 320).

Moving to options world, Summa in 2003 examines the records of Chicago Mercantile Exchange (CME). The study examines expiring and exercised options covering the period 1997-1999. The results show that 76% of all options held to expiration at CME expired worthless (out of the money). The author concludes, "option sellers had better odds than option buyers for positions held until expiration."

These results show that the majority of traders in options and futures are more likely to lose. This adds another dimension of risk in derivatives beyond those previously discussed.

Risk Dilemma

The above discussion does not deny any value of derivatives. After all, the Qur'ān points to some benefits of *maysir* or gambling: "They ask you concerning wine and *maysir*. Say: In them is great sin as well as benefits to people, but the sin is greater than the benefit" (2:219).

Derivatives provide value through management and distribution of risk. However, they are also perfect tools for gambling, and consequently would distort incentives in a manner that defeat their legitimate purpose. As Arrow (2003) points out, derivatives can be used for reducing as well as compounding risk. Derivatives make

hedging and gambling undistinguishable. The question therefore is: how can we obtain the benefits of hedging meanwhile avoid harmful speculation? This issue is still not resolved, even though derivatives are widely used.

As discussed earlier, futures and options were considered against the common law a century ago. Today, they are part of daily economic life. This transition, according to Kreitner (2000), was not achieved by changing the common law, or by discovering a formula to differentiate legitimate risk taking from illegal wagering. What happened is that "the question of gambling was eventually swallowed and internalized, as if the problem were solved. However, no analytical formula could distinguish gambling from risk allocation" and that the contract law "stopped worrying and learned to love risk" (p. 1096).

The same dilemma arises in the economic arena. The difference between arbitrage, that improves efficiency of the market, and gambling, which destroys market fundamentals, was and still, a subject of prolonged debate. Although it is easy to agree on the two opposite extremes, no "analytical formula" is developed to filter out the two in the vast majority of mixed situations in between.

Further, economists are well aware of two sorts of incompatible human behavior: Insurance and gambling. People purchase insurance to avoid risk, but do gamble and thus volitionally take risks. There are several attempts to explain this conflict (e.g. Arrow, 1971, pp. 22, 29; Shapira, 1995, p. 11), but apparently the conflict is not yet resolved. This again points to the two opposite extremes of risk. While there is a

human preference for risk taking, there is also a preference for risk avoidance. How to distinguish desired risk-taking from abhorred risk exposure is an age-old problem. The following sections explore the Islamic approach for resolving this dilemma.

IV

THE ISLAMIC APPROACH

More than 670 years go, Ibn Taymiah (728H – 1328G) wrote:

> Risk falls into two categories: commercial risk, where one would buy a commodity in order to sell it for profit, and rely on Allah for that. This risk is necessary for merchants, and although one might occasionally lose, but this is the nature of commerce.
>
> The other type of risk is that of gambling, which implies eating wealth for nothing (أكل المال بالباطل). This is what Allah and his Messenger (peace be upon him) have prohibited. ([2]; pp. 700-701.)

This phrase shows that Muslim scholars were aware of the dual forms of risk. Although there might be cases where it is difficult to distinguish between the two, the overall framework nonetheless is clear. The above statement shows that there are two types of risk:

1. Risk associated with normal economic transactions, i.e. value-adding and wealth-creating activities.
2. Risk associated with "eating wealth for nothing", or zero-sum activities, where no net additional wealth is created.

We shall address the first type of risk in this section, leaving the second to the next section.

Risk in Islamic Economics

If we define risk as possibility of loss, then it becomes clear from an Islamic perspective that risk as such is not desirable. Islamic principles clearly call for the preservation and development of wealth. Exposing wealth to loss cannot be a goal in itself. In fact, al-Qarafi clearly states that *ḍamān*, i.e. protection of wealth, is desirable for rational agents (cited in al-Suwailem [10]).

This is the same position towards hardship (مشقة). Although many Islamic deeds involve hardship of some sort, such hardship is not desirable in itself. According to Ibn Taymiah ([4]; pp. 10:620-622):

> Reward of deeds is based on their usefulness, not their hardness. A good deed might be hard, but its goodness is for a reason other than being hard. Reward may be larger if involved hardship is larger, not because hardship is the objective of the deed, but because the deed implies hardship.

In other words, hardship is secondary in determining the value of the deed. The primary factor is its usefulness. Accordingly, value would reflect its hardness, but only to the extent that it is useful.

The same reasoning applies to risk, as it is a form of hardship. Risk as such is not desirable, although it is intrinsic to virtually all economic activities. However, the value of an economic decision is not determined *primarily* because of risks it involves; rather, it is determined according to wealth it creates and value it adds. Risk is reflected in value accordingly, but not that risk in its own determines the value.

Whenever taking risk is praised it is because of the added value and created wealth that follows, not that risk as such is desirable. This represents a vital difference between legitimate and undesirable risk: Risk is legitimate when it is necessary for value creating. But when no value is added, it is a form of gambling.

Hedging

Hedging is used generally to denote neutralizing and minimizing risk. In this respect, it naturally belongs to Islamic economic objectives. As such, this is not an issue and should not raise any concerns. The issue, however, is how to reach this goal, and what means is used to meat this end. If the means involves pure speculation and gambling-like activities, it would be illegitimate, even if the objective is. Ends do not justify means (Ibn al-Qayyim [6]), and thus noble ends necessitate noble means. Obaidullah (2005) rightly notes, "the provision of hedging facility is hardly an adequate rationale for tolerating *qimār* and *maysir*. The Sharīᶜah does not disapprove of hedging, since it brings in some *maṣlaḥa*. It is the zero-sum nature of the game that the Sharīᶜah finds objectionable, as in it lie the roots of social disharmony and discord." (p. 176.)

To achieve legitimate hedging without *maysir* therefore is a challenge that both Islamic and conventional finance are facing. The objective of this paper is to explore and highlight milestones of the Islamic approach through which legitimate means can be developed to reach this essential goal.

Tolerable Risk

Muslim scholars discussed the conditions under which risk can be tolerated, and those under which it is not. Generally, they point that risk is tolerable if it satisfies the following conditions:

1. It is inevitable.
2. It is insignificant.
3. It is unintentional.

(See al-Dharir [12], pp. 587-612, and Hassan [7], pp. 464-469).

The first condition implies that the same level of added value of the concerned activity cannot be achieved without assuming risk of loss or failure.

The second condition concerns the degree of this risk. It states that likelihood of failure shall be sufficiently small. Scholars were clear that likelihood of failure should be less than that of success in order for involved risk to be acceptable (al-Dharir, *op. cit.*). We shall see later how this condition distinguishes the Islamic approach from conventional, Neoclassical approach.

The third condition follows from the first two. The objective of a normal economic activity is the value it creates, not the risk it necessitates. This risk therefore cannot be the intended part of the transaction.

Inevitability of Risk

The condition that risk shall be inevitable implies that risk is inseparable from real, value-adding transactions. As discussed in the

last section, separating risk from real transactions creates even more risks and makes the economy highly unstable.

From Sharīʿah point of view, exchange of pure liability for a given price (معاوضة على الضمان) is unanimously prohibited (al-Suwailem, 1999). This is consistent with the general trend of Islamic finance to be always linked to real transactions. Since derivatives by construction separate risk from ownership and thus from real activities, they appear in direct opposition to Sharīʿah principles. Not surprisingly, several Fiqh councils ruled that options and futures are unacceptable from Sharīʿah point of view (e.g. OIC Fiqh Council [14]).

From an economic point of view, risk is necessary for economic progress and wealth creation. According to Alan Greenspan:

> The willingness to take risk is essential to the growth of a free market economy. If all savers and their financial intermediaries invested only in risk-free assets, the potential for business growth would never be realized. (cited in Bernstein, 1996, p. 328.)

President of IMF, Horst Köhler (2004), reiterates this meaning: "Indeed, it is the willingness to take risk and tackle uncertainty that drives innovation and technical progress—and helps create jobs and build prosperity."

Thus risk by nature is inseparable from economic activities. Islamic requirements that risk may not be severed from real transactions therefore are only natural and conform to economic reality. Artificially severing risk will not make it disappear; rather, it will come back in even more dangerous forms, as discussed earlier.

Likelihood of Failure

It is clear from classical sources of *fiqh* that for risk to be tolerable the likelihood of failure shall be less than that of success. This is true regardless of the magnitude of the outcomes of the decision.

This is in sharp contrast to expected utility rule (and many competing rules for this matter), where decision is based on *expected* terms, i.e. the product of probability of the outcome times its magnitude. The difference between the two can be seen most clearly in lotteries.

In a lottery, an agent has an extremely small probability of wining the prize. Probability of losing the ticket's price is substantially large. From an Islamic point of view, this cannot be acceptable since it is almost certain that loss will materialize. Expected utility rule, in contrast, is based on the expected value regardless of which state is more likely to prevail. This is true even if probability of loss exceeds 99%, as long as the prize is sufficiently large. This rule leads to a kind of "wishful behavior," where an agent behaves according to his preferences or wishes more than to objective reality.

This kind of behavior is rightly described as deception and delusion, or *gharar*. The decision maker is deceived by the size of the prize such that he behaves as if it is more likely to obtain, when in fact it is more likely not.

Causality

The condition of dominant likelihood of success is equivalent to saying that the action shall lead or "cause" the successful outcome

to materialize. A cause needs not lead to the final outcome with certainty. It is sufficient that it does so more often than not (al-Suwailem, 2002).

From an Islamic perspective, uncertainty requires the decision maker to take proper causes to achieve desirable results, and entrust Allah to avoid possible but less likely failures. Taking proper causes is viewed as mandatory and not merely preferable. Entrusting Allah thus compliments rational decision-making and never substitutes for it. Taking an action that is more likely to lead to failure is a violation of Islamic teachings.

This clearly shows that playing a lottery is not acceptable since it is almost certain that the player will not win the prize and thus will lose the price. This is also true for any economic decision for which likelihood of failure dominates that of success.

Investment vs. Gambling

The causality rule can clearly distinguish investment from gambling. The key difference between the two is confidence of success. An entrepreneur starts a project because he is confident that the project would succeed. A gambler knows in advance that he is more likely to lose than to win. However, the size of the prize deceives him to engage into such a losing project.

This difference is consistent with the concept of causality according to Islamic principles. An action that leads to failure more frequently than success cannot be considered as a cause of success. It is a cause of failure.

Expected utility rule in contrast does not differentiate between a cause and a non-cause. It mixes the likelihood of the outcome with its magnitude, and decision is based on the final product. No attention is given to how the outcome is reached, whether systematically or by blind luck. This is not the way agents normally evaluate their decisions. According to Ben-Ner and Putterman (1998):

> Individuals care about the manner in which they themselves and others behave, including the ways in which they attain outcomes of interest. ... Uncommon is the individual who is indifferent about whether he has achieved his income through honest work or blind luck, whether he has cheated others or treated them fairly. (p. 20)

Choice under Uncertainty

Conventional theories of choice, most obviously expected utility, cannot distinguish investment from gambling. Rather, decision under uncertainty is viewed simply as a choice among lotteries (e.g. Varian, 1992, and Jehle, 1991). Not only this is inconsistent with the Islamic view, it is also inconsistent with real decision making in business environments.

Studies by MacCrimmon and Wehrung (1986) and Shapira (1995) show that business managers rarely take risk as given. They consistently attempt to adjust risks such that they are confident of the successful outcome. According to Shapira: "Managers see themselves as taking risks, but only after modifying and working on the dangers so that they can be *confident of success*" (p. 74; emphasis added). In this

context, risk taking "is an endeavor where a manager can use his judgment, exert control, and utilize skills". This is absent from gambling (p. 48). Shapira concludes that the "gambling metaphor appears as an inadequate description of managerial risk taking" (p. 120). James March, decision scientist at Stanford University, writes:

> Although theories of choice tend to treat gambling as a prototypic situation of decision making under risk, decision makers distinguish between "risk taking" and gambling, saying that while they should take risks, they should never gamble. They react to variability more by trying actively to avoid it or control it than by treating it as a tradeoff with expected value in making a choice. (1994, p. 54)

These results point to the fundamental difference between risk taking associated with real business activities, and gambling where likelihood of failure is dominant, but the size of the outcome deceptively makes the choice acceptable.

A Causal Decision Rule

If we want to amend the expected utility rule in the light of the above discussion, one way to do so is to impose a constraint on the likelihood of success. Suppose that an action a would lead to outcome $x_i \geq 0$ in state i, $i = 1, \ldots, n$, with probability p_i. Probabilities could be objective or subjective, as long as they satisfy axioms of probability. Let $v(x_i)$ be the payoff (utility) function of the decision maker in state i, and let $c(a)$ be the cost of action a. Expected utility requires an action a is admissible as long as:

[1] $$U(a) = \sum_{i=1}^{n} p_i v(x_i) - c \geq 0 .$$

For example, the action could be to purchase a lottery ticket for which the prize is, say, one million, and $c = 1$ is the price of the ticket. Then the outcomes are either to win the prize, whereby $x_1 = 1000{,}000$, or not, whereby $x_2 = 0$. The action is admissible as long as the expected payoff is non-negative. If the probability of winning is one in million, and the payoff function is linear, then we have:

$$v_1 = 1{,}000{,}000 ,\ v_2 = 0 ,\ c = 1 ,\ p_1 = \tfrac{1}{1{,}000{,}000} ,\ p_2 = \tfrac{999{,}999}{1{,}000{,}000} .$$

Consequently, $U(a) = 0$. Thus, purchasing the ticket would be admissible. To exclude this sort of behavior, we have to impose a restriction on admissible probabilities. This can be achieved by subjecting [1] to the constraint that probabilities of success are larger than those of failure. Let S be the set of outcomes for which $v(x_i) - c \geq 0$, and let S' be its compliment, i.e. for which $v(x_i) - c < 0$. The set S represents the set of successful outcomes, while S' represents unsuccessful ones. Then action a is admissible as long as:

[2] $$U(a) = \sum_{i=1}^{n} p_i v(x_i) - c \geq 0 \text{, and}$$

[3] $$\sum_{i \in S} p_i > \sum_{i \in S'} p_i .$$

The constraint [3] requires that total probability of success exceeds that of failure. Since total probability of all outcomes equals one, then condition [3] is equivalent to requiring that $\sum p_i > 0.5$ for $i \in S$. This condition therefore excludes outcomes with low probabilities that might be chosen merely because of the associated large payoffs, i.e. gambling.

Statistical Measure

A more direct representation of the causal rule can be obtained by invoking statistical measures of probability distribution. The expected utility rule is equivalent to the *mean* of the payoffs distribution. The mean is a measure of the central tendency of the distribution, defined as the sum of the values of the random variable weighted by their respective probabilities.

An alternative measure is the *median*. The median is commonly defined as the point that divides total distribution into two equal parts, each with probability of 50%. A more general definition, suitable for both discrete as well as continuous distributions, is provided by DeGroot (1986, p. 207). The median is defined as a value m of a random variable $\tilde{x}$ such that:

[4] $$prob(\tilde{x} \leq m) \geq 0.5 \text{ and } prob(\tilde{x} \geq m) \geq 0.5 .$$

That is, the probability distribution on either side of the median is *at least* 0.5. The two sides therefore need not be equal. For the outcomes of a given action *a*, the median payoff $\hat{v}$ is defined as:

[5] $prob(v(\tilde{x}) \leq \hat{v}) \geq 0.5$ and $prob(v(\tilde{x}) \geq \hat{v}) \geq 0.5$.

A decision rule based on the median would require that an action *a* is admissible if the median payoff is non-negative, i.e.:

[6] $U(a) = \hat{v} - c \geq 0$.

To apply this rule to the lottery example, recall that there are two payoffs (assuming linearity of v):

$$v_1 = 1{,}000{,}000 \text{ with } p_1 = \tfrac{1}{1{,}000{,}000}, \text{ and}$$
$$v_2 = 0 \text{ with } p_2 = \tfrac{999{,}999}{1{,}000{,}000}.$$

The median of this distribution is v_2, since it satisfies the conditions in [5]. To see this, note that $prob(v(\tilde{x}) \leq v_2) = p_2$. That is, probability to get at most a zero-payoff (which is the smallest payoff) is greater than 0.5. Next, $prob(v(\tilde{x}) \geq v_2) = 1$. That is, a player is certain to get zero or more. (The reader may want to verify that v_1 violates [5] and thus cannot be a median.) Since the median is zero, the utility of purchasing a lottery ticket becomes negative, and therefore the decision is not admissible.

Note that this result is obtained regardless of the shape of the utility function. This makes the median rule robust with respect to the specification of risk preferences of the decision maker. Statistically, it is well known that the median is more stable than the mean, and

represents the central tendency of the distribution more accurately (DeGroot, 1986, pp. 208-209).

It is somewhat surprising that while the median is more robust than the mean, it is also more consistent with Islamic and moral principles regarding wagering and gambling. The rule succeeds, at least to some extent, in distinguishing acceptable risk taking from gambling, a problem that puzzled lawmakers and economists alike. The median rule is consistent with results of evolutionary game theory, which point that "nature abhors low probability events" (Gintis, 2000, p. 117). From an evolutionary point of view, low probability events add little to agents' fitness, and thus are evolutionarily unimportant. Since few studies examine the median as a decision rule under uncertainty, further investigation is needed to explore and better understand its implications.

Derivatives

As discussed earlier, trading derivatives, such as futures and options, results in losses more than 70% of the time. Since likelihood of failure exceeds that of success, such instruments are considered as factors of loss, not of gain, which violates condition [3] above. Further, using the median rule in [6], the decision to trade derivatives becomes inadmissible. Only in expected terms might they appear profitable. But the expected utility rule is questionable, both from an Islamic perspective as well as real business decision-making, as explained earlier.

From the above discussion, none of the requirements of tolerable risks are satisfied by derivatives. This raises deep questions about Islamic legitimacy of these instruments.

The fact that derivatives by design are zero-sum games is another dimension of the subject that will be treated in the following section.

V

THEORY OF *GHARAR*

The word *gharar* in Arabic language means risk. It also has the meaning of deception and delusion (al-Dharir [12]). The two meanings coincide most clearly in prospects with low probability but large magnitude, as in lotteries and all forms of gambling. The size of the payoff entices the agent to engage into an almost losing game. This is the essence of gambling that conventional choice rules fail to exclude, as discussed earlier.

While the previous section focused on individual decision-making, this section focuses on bilateral or interactive decisions. In such interactions *gharar* takes a definitive structure. It becomes equivalent to a zero-sum game with uncertain payoffs (al-Suwailem, 1999). This structure is consistent with Sharīʿah measures of *gharar*. The measure can be used as a basis for evaluating as well as developing risk management instruments consistent with Sharīʿah, as will be discussed below.

Types of Games

The term "game" is used for a variety of settings and arrangements. Here it is used to denote a for-profit exchange among

two or more agents, whereby agents' payoffs are uncertain at the beginning of the game.

Games can be classified according to the sum of players' payoffs into three categories: positive-sum, zero-sum, or mixed-sum games.

1. Positive-sum games are games in which players have common interests, and thus they gain together or lose together (see Figure 7). Since agents are assumed to be rational, the losing outcome will not be their objective of the game. The positive outcome therefore is the objective of the game, and for this reason it is described as a positive-sum game.

In Figure 7, (*A* , *B*) denotes players of the game. The right branch denotes the positive payoffs for each (the first is the payoff of *A* while the second is that for *B*). The left branch denotes negative payoffs. At the start of the game, it is not known which branch they will arrive at. However, each player is assumed to seek the positive outcome rather than the negative one, and thus the objective of the game becomes mutual gain. If agents follow the median rule discussed earlier, then the positive outcome will be more likely to materialize. This makes the game Pareto-optimal, since both players are likely to be better off playing the game compared to not playing it.

An example of a positive-sum game is partnership or *mushārakah*. Since each partner contributes capital and labor, both would gain if the project succeeds, and both would lose if it fails.

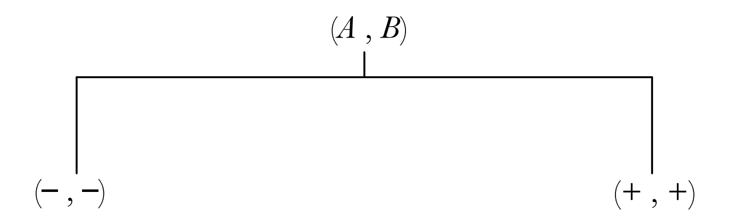


Figure 7: Positive-sum Games

Note that the size of the payoffs need not be equal for the two parties. But the sign must be identical; that is, they gain together and lose together, although the contribution of each might not be equal.

2. Zero-sum games are games in which one party gains and the other loses (Figure 8). Gambling is the most obvious example: Two players put, say, 1000 each, and a coin is thrown. If it comes head, *A* wins 2000, otherwise *B* wins.

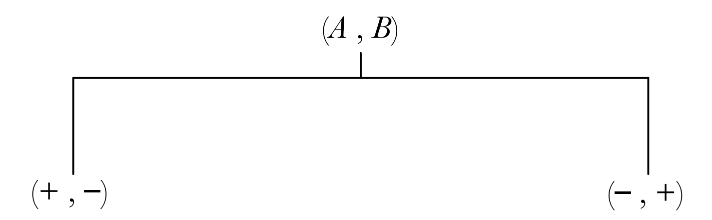


Figure 8: Zero-sum Games

Obviously, there is no possibility that the two could both win. One player wins only at the expense of the other. Again, the magnitudes of gain and loss need not be equal. The term "zero-sum" indicates that the interests of players are in direct opposition. As textbooks on game

theory show, such games can always be reformulated so that the payoffs add to zero (Friedman, 1990, pp. 79-80; Binmore, 1994, pp. 276-277). We shall use the term "zero-sum game" to indicate games of direct opposition, regardless of the size of payoffs. Zero-sum games are Pareto-inferior, since they do not allow mutual gain of players. Agents are better off *not* playing the game (al-Suwailem, 1999).

3. Mixed games are games that include both sorts of outcomes: the zero-sum outcome as well as the positive-sum outcome (Figure 9).

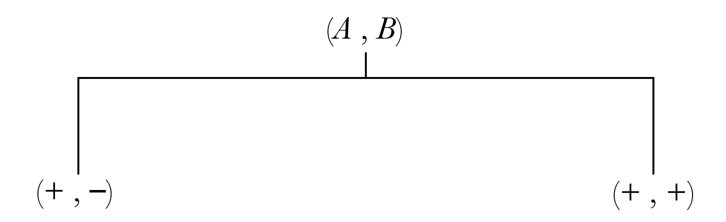


Figure 9: Mixed Games

These games allow for mutual gain, but also imply the possibility of conflict of interest. Examples of mixed-games include sharecropping or *muzāraᶜah*, *jaᶜālah*, and *ᶜurbūn* (see al-Suwailem, 1999). In fact, most economic activities are mixed or non-zero-sum games, as Schelling (1980) points out. Life therefore is not a gamble, as many writers claim. It is a mixed game that could end up in conflict or in cooperation. Wright (2000) argues that evolution, both social and biological, progresses towards non-zero-sum interactions. We shall see

later how the structure of mixed games can be useful in developing Islamic hedge instruments.

Measure of Gharar

In a zero-sum game, one party gains at the expense of the other. It is a pure transfer of wealth for no counter-value. Since each party is seeking profits not donations, it becomes therefore a sort of "eating wealth for nothing," strictly condemned in the Qur'ān. Further, a zero-sum game is a game with direct conflict of interests, which represents the source of enmity that accounts for the prohibition of *maysir* or gambling in the Qur'ān: "Satan only wants to plant enmity and hatred among you through wine and *maysir*" (6:91).

On the other hand, gambling represents the purist form of *gharar* (al-Dharir [12], p. 622). Since gambling is obviously a zero-sum game, it follows that *gharar* must be unacceptable to the extent that it possesses the zero-sum structure. Accordingly, the circle of *gharar* is wider than that of gambling. For this reason, some transactions might contain *gharar* (i.e. a zero-sum outcome) but they are still acceptable if it the zero-sum component is dominated by the positive component, as in sharecropping and *jaᶜālah*.

From Sharīᶜah point of view, generally speaking, the acceptability of such mixed games depends on the likelihood of the cooperative, positive-sum, outcome. If this outcome is dominant, the game generally is acceptable. In this case, the zero-sum outcome is considered as "minor *gharar*." If the zero-sum outcome is dominant, it becomes "excessive *gharar*" and thus not acceptable.

Technical formulation of this measure, as well as detailed discussion of several examples and applications, is provided in al-Suwailem (1999).

Characteristics of Zero-sum Games

Although it might appear fuzzy, the zero-sum property, in its basic form, is quite clear: Whatever one party gains is what the other loses. The following points help clarify how this structure applies to different forms of transactions.

1. First, note that in any zero-sum game, uncertainty at the time of contract is an essential condition. If it were known upfront, the game would not have been played. For example, if it were known on which side the coin will land, there is no point of betting. This is not the case in games with mutual gain. In a normal sale, where relevant variables are known upfront, the sale takes place with full information. Even if all future information were known at the beginning, the sale will still be performed if it satisfies the needs of the two parties.

2. It should be noted also that gains and losses in a zero-sum game are determined bilaterally, i.e. between the two parties of the contract. That is, an actual net transfer of wealth takes place at maturity from one party to the other, with no counter-value in exchange. If one buys a good on spot basis, and its price subsequently falls, this loss is not a direct gain to the first seller, except as foregone losses. But contractually, no counter party has these losses credited to

his account as gains, and thus no net transfer of wealth takes place. Although trading of shares or commodities might at times appear as a zero-sum game, it is only at the system level. Individually, however, spot trading, with predetermined prices and parameters, cannot be a zero-sum game since the relationship between the two parties ends the moment the trade is concluded. Only in presence of uncertainty during the contract that a zero-sum exchange might, but not necessarily, arise.

3. Derivatives are clear examples of zero-sum games. They are obligations to exchange certain amounts of money in a future date. The difference between prices at the time of contract and at maturity is debited from one party and credited to the other, and that is why they are called contracts for differences. With mark-to-market system, this is done on daily basis. Even if the derivative is traded in a secondary market, the obligation as such survives throughout the life of the contract, and whoever becomes party to it has to settle these differences.

4. Financial markets as a whole might appear at times as zero-sum systems. Pyramid schemes are also zero-sum systems. But this applies to the system as a whole, not to individual contracts as such. Zero-sum systems arise because of misuse of normal, non-zero-sum contracts. However, with zero-sum contracts, the system by design will have a zero-sum structure. That is, systems of zero-sum contracts are

zero-sum overall, but systems of non-zero-sum contracts may or may not be zero-sum overall.

For this reason the Prophet, peace be upon him, has put further conditions on normal sale, e.g. not to sell before possession or to sell what one doesn't have. These conditions help make the system overall positive-sum and prevent what Shiller (2000) calls "naturally occurring Ponzi processes" (pp. 64-67). During speculative bubbles, the market as a whole behaves as a Ponzi scheme: early investors get returns from newcomers, and newcomers profit from those joining afterwards, and so on, but latecomers eventually bear the cost when the market crashes. While financial markets in principle are useful and provide important economic functions, they need to be regulated in order to minimize such Ponzi processes from taking over. For example, James Tobin (1978) and Lawrence and Victoria Summers (1989) propose a transaction tax to reduce frequent trading and thus to curb speculation. Allais (1993) calls for abandoning continuous quotation of prices, and having a single quotation per day. He also insists that margins on forwards should be considerably increased to avoid harmful speculation (p. 36). Recall that in Islamic forwards, i.e. *salam*, the full price must be paid in advance, which points to the economic rationale for this condition. Detailed discussion of financial markets reform is beyond the scope of this paper, but the point should be clear: non-zero-sum contracts might lead to Ponzi, zero-sum systems if not properly regulated.

The above discussion hopefully clarifies the difference between zero-sum contracts and zero-sum systems. The former implies the latter, but the opposite is not necessarily true.

Expected vs. Actual Measures

The zero-sum measure is based on actual, realized outcomes of the transaction. Derivatives and all forms of gambling are zero-sum games in this respect. In expected terms, however, they might be considered as mutual gain deals. In other words, they might be win-win games ex ante, but win-lose ex post. The two measures are clearly incompatible, and thus a choice must be made between the two.

Economic success obviously is based on, and measured in terms of, actual and realized performance. In expected terms, LTCM might have been a profitable investment. In early 1998, the fund's value-at-risk (VAR), which measures the maximum daily loss in any single day with 95% confidence, was less than 1% of its capital. The probability that the fund would lose all its capital within a year was 10^{-24}. That is, it would take several multiples of the lifetime of the universe for this event to occur (Lowenstein, 2000, p. 159; Partnoy, 2003, p. 257). Few months later, the fund collapsed when losses wiped out most of its capital. In other words, failure also is measured in ex post terms. Bankruptcy is decided according to actual, not expected, results. Similarly, profits and losses of derivatives are calculated daily through marking to market, not based on the overall, expected, value of the contract. Consequently, whenever expected and actual measures are in conflict, the latter obviously will have the precedence.

This is supported by the nature of uncertainty. Uncertainty reflects our ignorance of the reality. It therefore exists only in human minds. In reality, things either exist or do not exist. Nothing in the outside universe is random or undetermined. "God does not play dice," as Albert Einstein famously affirmed (Pais, 1982). The Qur'ān clearly states: "Verily all things We created in (precise) amount" (54:49), "And every single thing is before Him in (due) proportion" (13:8). Uncertainty and risk therefore cannot exist outside human mind.

Accordingly, risk per se is not in fact traded, as it cannot exist in reality. What is *actually* traded is money for money. Kenneth Arrow (1971) points to this fact with respect to commercial insurance. He describes it as an "exchange of money for money, not money for something which directly meets needs." (p. 134.) Since this exchange is contingent on a certain event, the contract ends up in payment in one direction only. If the event occurs the insurer pays to the insured more than the latter has paid, and thus the net-payment becomes money for nothing. The opposite is true if the event does not occur. In either state one party pays something for nothing. Only in expected terms that there is a mutual exchange. Ex post, however, no mutual exchange takes place, and it becomes a sort of eating wealth for nothing.

This clearly reflects the discrepancy between actual and expected measures in case of zero-sum games. This discrepancy is closely related to that between the mean and the median discussed earlier. The discrepancy arises in case of "outliers," i.e. outcomes with

low likelihood but large magnitude. It is such cases where gambling arises, and the need for careful discrimination of types of risk is called for. The zero-sum measure provides an important landmark in achieving this objective.

Risk and Zero-sum Structure

There are several reasons why a zero-sum market is more risky than a normal market:

1. Earlier we argued that a zero-sum market does not create additional wealth to balance the additional risks created through interaction of agents. This is particularly true when the market is highly leveraged, as it is the case with respect to derivatives.

2. A zero-sum structure by design is relative: The payoff of one agent is the negative of the other. Relative payoff makes agents' behavior highly sensitive to each other. Consequently, a feedback loop is created as changes in an agent's behavior feeds back to itself through the behavior of others. The positive feedback loop and recursiveness of the system makes it increasingly nonlinear and thus prone to chaotic episodes, as several writers have pointed out (Sornette, 2003; Tumpel-Gugerell, 2003; Mandelbrot and Hudson, 2004; Bennett, 2004).

3. A derivative by design is derived from an underlying asset or variable. Movements in this variable would register profits for one party and equal losses to the other. In a zero-sum market, where all transactions are zero-sum games, any change in relevant economic

variables will necessarily create losses to some parties. The market has no room for mutual gain and common reward. Since risk is defined in terms of exposure to loss, a zero-sum market almost by definition becomes more risky than a normal one.

For example, in a futures market of a certain commodity, any change in the price of the commodity registers profits to one party and equal losses to the other. In a *salam* contract, in contrast, the price is paid in full in advance. The advanced payment provides the seller the possibility to utilize it in a manner that could compensate for moderate price increases of the commodity. On the other hand, since delivery is destined to a future date, the paid price is lower than the spot price. This discount provides a cushion for the buyer against moderate price declines. Therefore, the advanced payment provides a “safety margin” for both parties against moderate price fluctuations. This is in contrast to leveraged futures, where *any* price fluctuations presents a gain to one party and a loss to the other (al-Suwailem, 1999, pp. 84-85).

As another example, consider companies that provide their employees options to buy shares of the company at a predetermined price. Rise in the share’s price above that given to employees is a gain to the employee and a cost to the company. However, this cost is utilized as an incentive to employees, so the final result of the contract is a win-win outcome (notwithstanding possible misuses of stock options). That is, wealth created through employee’s effort compensates for the loss arising from the increase in the share’s price. In contrast, in a call option, *any* changes in the price of the underlying will register gains to one party and losses to the other.

Derivatives deliberately sever wealth-creating activities from risk management, making them by construction zero-sum games. A derivative contract does not require the creation of wealth that balance the losses involved. The argument that risk trading promotes value-creating activities, if true, reinforces the Islamic position, since integrating the two will not be harmful. The integration would produce effectively the same result, but provides better incentives to do so.

4. In a zero-sum market all players are in direct conflict. This results in players taking advantage of each other when economic variables move unfavorably to some. Thus the likelihood of failure of inflicted players will rise beyond that determined by exogenous economic forces. This apparently what happened to LTCM, when investors became aware of the losses the fund suffered after the crisis of Russian bonds and other emerging markets in 1998. Traders started betting against LTCM, causing further losses to the fund. In the words of Partnoy (2003, p. 260): "Other traders smelled blood at LTCM, and began betting against the hedge fund, trying to weaken its positions." LTCM was acting as "bank of volatility," and thus suffered "a classic run." According to Lowenstein (2000): "It made no difference whether banks were consciously trying to profit at Long-Term's expense or merely protecting themselves … *Either motivation would have produced the same behavior*" (p. 174, emphasis original). The fact that investors while protecting themselves necessarily attacked LTCM is a characteristic feature of zero-sum games. Since interests were in

direct opposition, the benefit of one party necessarily implies the harm of the other.

Together with moral hazard, this shows that incentives react to the payoff structure in a manner that might distort behavior and thus create additional layers of risk to the system.

Since the zero-sum structure creates unnecessary risks, it becomes consistent with a widely held view that gambling is characterized by involving artificial risks (e.g. Borna and Lowery, 1987; Raines and Leathers, 1994). The zero-sum structure therefore is a sufficient condition to consider a certain transaction as gambling regardless of the tools used to implement it.

Two Measures of Gharar

In the last section we argued that taking risk would be acceptable, in a real transaction, if success was more likely than failure. A deal that is more likely to fail is more of a gamble than an investment. It is therefore a form of *gharar*. Here we argued that *gharar* is a predominantly zero-sum game. That is, we have two measures of *gharar*:

1. The likelihood measure.
2. The zero-sum measure.

The first is related to individual decisions, while the second is related to interactive decisions. But how these two measures are related to each other?

First, note that in a zero-sum game, there is no way that both players could win with probability greater than 0.5. Suppose that one player is likely to win with probability 70%. Since it is a zero-sum game, then if one party wins the other must lose. This means that the other player must lose with probability 70%. That is, a zero-sum game does not allow success to be more likely for both players. Thus the zero-sum measure implies the likelihood measure.

Next, the likelihood measure in principle is more general the zero-sum measure. To see this, consider an investment decision that has negligible chances to payoff. For example, a speculator decides to build a shopping mall in uninhabited area. Although the contract with the construction agent is a legitimate transaction, in terms of its final objectives it is a gamble on the side of the speculator. Thus, a legitimate, real transaction could be used for illegitimate purposes. This shows that the likelihood measure is broader than the zero-sum measure.

However, in a competitive economy, such highly risky decisions would eventually be transformed into zero-sum games. If an investor is willing to spend money for a highly risky project, then another agent would step in and offer to take less money in exchange for a higher return but with low likelihood. Ex ante, both parties are better off, and thus highly risky projects cannot continue for a long time. Accordingly, the likelihood measure, while pertain to individual decision-making, naturally leads to the zero-sum measure.

The two types of *gharar* might help clarify two widely used, but still ambiguous, terms: speculation and gambling. We might describe

the first type of *gharar* as "speculation," and the second type as "gambling." Speculation thus is to use a legitimate contract for highly risky purposes. It describes a mixed game where the zero-sum outcome is more likely to obtain. Gambling, on the other hand, implies a stronger connotation, as both parties are involved in direct conflict or a strictly zero-sum game. From the above discussion, speculation eventually transforms into gambling. Further, speculation, in this context, transforms a market of non-zero-sum contracts to a zero-sum system, like Ponzi or pyramid schemes.

Value of Risk Management

As point out earlier, hedging is valuable and consistent with Islamic economic objectives. However, conventional instruments, mainly derivatives, cannot separate hedging from speculation. They are used indistinguishably for both purposes, but mostly, 97%, for speculation. How can we realize the value of hedging and risk management without incurring the increasing costs of speculation?

From an Islamic perspective, the answer may not be very difficult. Islamic rules of exchange, being revealed from Allah (*s.w.t*) and thus entail His perfect wisdom and knowledge, provide the right framework for achieving this challenging objective. The general principle, which is a matter of consensus, is that risk cannot be severed and separated from real transactions. This will make risk transfer a zero-sum game and thus a form of eating wealth for nothing, which is strictly and explicitly prohibited by the Qur'ān (e.g. 2:188, 3:29).

To achieve desirable risk transfer, therefore, we have to utilize structures that allow for mutual gain, i.e. nonzero-sum games. Such games, while imply the possibility of a zero-sum outcome, permit a positive-sum outcome, and thus provide a room for mutual benefits. This is the general strategy for developing risk management tools that are consistent with Islamic principles. The following sections attempt to implement this strategy.

VI

FINANCIAL ENGINEERING: AN ISLAMIC PERSPECTIVE

The term "financial engineering" has many connotations, and might have different meanings in different contexts (Marshall and Bansal, 1992). In conventional financing, it relates mostly to derivatives. But the term is broader than that. For Islamic finance, the concept takes a special importance, as we shall see.

Definition and Concept

According to Finnerty (1988, 1994), financial engineering involves the "design, development and implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance." The objectives of financial engineering are to lower transaction costs and achieve better returns (Merton, 1992).

Innovation by nature is unpredictable. If it were, it is no longer innovative. Thus, attention should be directed towards tools and techniques that facilitate innovation and creativity. Financial engineering therefore can be better described as: *principles and strategies for developing innovative financial solutions*.

The difference between tools for innovation and innovation itself is emphasized by de Bono (1970). He coined the term "lateral thinking" to describe thinking strategies and techniques that permit and encourage creativity. Creativity therefore is a consequence rather than the subject of analysis. Similarly, financial engineering should be concerned with tools and techniques for developing creative instruments and innovative products (see also Mason et. al., 1995, p. xiii).

From an Islamic point of view, there are Sharīʿah principles that should be observed for developing financial products. Thus the definition emphasizes both principles and strategies for financial innovation.

The definition mentions financial solutions rather than instruments or contracts (al-Suwailem [8]). This highlights the added value of innovation. A "solution" is something that satisfies a genuine need that was not possible before. This is general enough to include processes, instruments, or products that result in better efficiency and returns, as emphasized by Merton (1992). According to Mason et. al. (1995), financial engineering shall not be measured by the complexity of mathematical models involved or of the legal documents required. Rather, it is measured by the expanded economic and managerial flexibility it offers (p. xiii).

Value of Innovation

Innovation is a change, and change creates instability. Instability obviously is not desirable, and thus innovation in itself is not

a goal. Only when innovation creates value, which offsets the instability it creates, that it becomes desirable. Innovation therefore is a tool and a means for generating value. Mason et. al. (1995) rightly note that relevance of financial innovation is measured by its impact on the effectiveness of the financial system, not by its novelty. Leathers and Raines (2004) point to the negative effects of derivative innovations, and that such innovations are inconsistent with the Schumpeterian view of creative destruction. This confirms the need for innovations within a different framework and in a different direction.

Sharīʿah and Creativity

Sharīʿah provides a comprehensive set of rules governing and guiding human behavior. Although these rules restrain behavior in many respects, this does not hinder creativity. In fact, the opposite is more likely to be true, since creativity is stimulated by constraints. Elster (2000) shows how and why rational agents in some cases might be better off when they have fewer options. In such cases, less is more, which has been supported by many experimental studies (Gigerenzer et al., 1999). Elster also shows how artists, for instance, deliberately choose to restrain themselves in order to be more creative. Silber (1983) provides evidence that constraints were a major force behind financial innovations that improved economic performance and welfare.

Thus, constraints need not hinder creativity. This is especially true with respect to Divine rulings. Such rulings imply the ultimate

wisdom of Allah (*s.w.t.*), and their observance therefore will only improve human life. Islamic teachings in general provide the right environment for valuable creativity and innovation. The Qur'ān frequently emphasizes reflecting and pondering upon signs of truth, and condemns those who blindly follow inherited culture even if it contradicts the facts. Again, contrarious thinking is not necessarily a virtue in itself, but a means to discover the truth and avoid deceitful perceptions.

Regulatory Arbitrage

Merton Miller (1986) argues that a major impulse for financial innovation is to avoid regulation. Given the increasingly globalized financial markets, investors face different regulatory environments. This creates an opportunity to overcome local regulations using suitably designed instruments (mostly derivatives) issued across the boarders. Free-market advocates particularly see regulations hindering economic efficiency, and thus consider circumventing regulations via financial innovation as a means to restore market efficiency (Partnoy, 1997).

This might be relevant for outdated or artificial regulations that serve little or no social function. However, regulation in principle serves a crucial role in stabilizing the market and minimizing systemic dangers. Regulations regarding disclosure and capital requirements, for example, are essential for self-discipline and risk control. Circumventing such regulations, through financial innovation and

accounting manipulation, very likely leads to undesirable consequences, with Enron and similar episodes as visible examples.

Similarly, from an Islamic point of view, circumventing Sharīʿah principles would negatively affect market performance and jeopardize objectives of Islamic finance in the first place. More on this point later in this section.

State of Financial Innovation

Professor Peter Drucker (1999) argues that financial-services industry is now declining. The reason, he writes, is simple: "The dominant financial-services institutions have not made a single major innovation in 30 years." Instead of inventing new services to customers, financial firms are mostly trading for their own accounts, thus involved in a "zero-sum game," since the gain of one firm is the loss of the other. The only innovations during the past three decades, he argues, have been "allegedly 'scientific' derivatives," which are no more scientific than systems used in Monte Carlo or Las Vegas. "As a result, the industry's products have become commodities and increasingly both less profitable and more expensive to sell."

Drucker argues that there are now three possible roads the industry can take. The easiest is to keep the current practices and trends. The industry may survive, but will continue to decline. The second is for the industry "to be replaced by innovating outsiders and newcomers." The third is for the industry players "to become innovators themselves and their own 'creative destroyers'." With the increasing change in world economy, the first road is not really an

option. Thus, the industry either changes itself, or outsiders will do so. Not surprisingly, he titles his article: "Innovate or die."

This points that the Islamic industry has a good opportunity at this stage to provide genuine and value-adding financial services that the industry is seriously lacking.

Principles of Islamic Financial Engineering

From an Islamic perspective, we can identify four principles for financial engineering, two concern objectives: principle of balance and principle of integration, and two concern methodology: principle of acceptability and principle of consistency.

Principle of Balance

This principle reflects the comprehensive approach of Islamic principles to human incentives. It stresses the balance between self-regarding and others-regarding interests, between for-profit and non-profit activities, between competitive and cooperative relations. Islamic rules draw clear and decisive boundaries between the two domains, and successfully achieve internal balance and equilibrium between the two. The obligation of *zakāt* and prohibition of *ribā* are two clear examples. Capitalism stresses for-profit and market-oriented approach for nearly all economic problems. Communism, on the other hand, relies mainly on non-profit mechanisms to solve the same problems. Islamic economics, in contrast, takes a balanced approach. Both for-profit and non-profit mechanisms are essential for satisfying economic needs.

No economy can thrive solely on for-profit transactions. In fact, the existence of the society, through families and communities, is based on cooperative rather than for-profit bases. Nonprofit organizations account for about 90% of all non-governmental schools and colleges, and two-thirds of all hospitals in the U.S. (Hansmann, 1996).

Accordingly, many financial and economic objectives can be achieved through cooperative, rather than for-profit, arrangements. The most obvious example is insurance. While commercial insurance is widely considered unacceptable from Sharīᶜah point of view, cooperative and mutual insurance is unanimously accepted. Cooperative arrangements can be more efficient than commercial instruments, and thus better able to serve relevant needs.

Interdependence

It is important to note that cooperative arrangements differ from donations and charity. Professor Stephen Covey (1990) classifies human relations into three stages depending on their degree of maturity:

1. Dependence
2. Independence
3. Inter-dependence

The first stage is dependence, where one relies on others to satisfy his or her needs. This is especially true in the early stages of life, where a child is largely dependent on his parents and family. Afterwards, one

builds up his identity and tries to be independent from others. The most advanced stage is inter-dependence. It is a mutual relationship between independent persons that utilizes benefits of cooperation to achieve results no single person can.

These three stages have their counterparts in economic behavior. Dependence corresponds to reliance on donations and charities. The receiver is dependent on the donor. At any point in time, there are always people who cannot satisfy their needs on their own, and must depend on others for that. Independence corresponds to self-interest, for-profit, transactions. Agents get what they want through their own resources. The most advanced stage, inter-dependence, corresponds to mutual and cooperative behavior. It is also called reciprocal relations (e.g. Gintis et. al., 2005; Sobel, 2005). These are neither pure for-profit nor pure charity, but combine properties of both to achieve higher objectives. While communism was concerned mainly with solving the problem of dependent agents, capitalism is concerned mainly with achieving independence through self-interest and market forces. Islamic economics acknowledges these two types of relations, but adds to them the more mature relation: cooperation and inter-dependence.

As we shall see later, cooperative insurance is built on reciprocal, inter-dependent relations, rather than pure charity and donation.

Principle of Acceptability

This principle belongs to methodology but logical sequencing requires presenting it at this point. The principle states that all economic dealing are generally acceptable unless otherwise stated by Sharīᶜah (e.g. Ibn Taymiah [3]).

The principle is based on the assumption that economic interactions aim to satisfy normal human needs and preferences. Islam views man to be driven by nature to the good, and thus normal interactions will normally lead to the good of the society. Obviously, evil exists, and this is why there are rules to govern economic behavior.

These rules are on the preventive side with respect to for-profit activities, but are on the affirmative side with respect to non-profit activities. The reason is the nature of human incentives. According to al-Shatibi [11], whenever there are sufficient incentives to pursue legitimate objectives, like seeking profits, the Qur'ān will not overly insist on it to avoid extreme responses. On the other hand, when there are less than sufficient incentives to pursue some objectives, like giving donations, the Qur'ān will particularly emphasize it to compensate for reduced incentives. This explains why most Sharīᶜah regulations of for-profit transactions are on the preventive side. Nonetheless, the Qur'ān in many verses praises commerce and trade (e.g. 73:20).

The principle of acceptability is a corner stone for innovation. There are no limits on human imagination and creativity, as long as it does not cause more harm than good. One needs only to check that

none of the prohibited dealings contaminate the transaction. Beyond that, all possibilities are open.

Accordingly, if two views are presented regarding a certain product, one considers it acceptable while the other doesn't, then the burden of proof is on the latter. Those who accept don't have to prove it, since this is the default position of Sharīᶜah.

Roots of Prohibited Dealings

Based on the principle of acceptability, we need to worry mainly about prohibited dealings with respect to for-profit activities. Generally speaking, most regulations of for-profit activities serve to prevent the most serious unjust dealings: *Ribā* and *gharar*. We have already discussed the concept of *gharar* in detail, so we will focus here on *ribā*, as well as the common aspects of the two.

Ribā or usury, is essentially interest on lending. Islam is not unique to prohibit *ribā*, since all divine religions do (Chapra, 2004). The objective of finance in general is to promote growth and fair distribution of real resources. Prosperity and welfare are determined ultimately by real wealth. Accordingly, the financial sector works to serve the real sector.

Ribā separates finance from real transactions. Since the two counter-values of a loan are identical, it follows that interest becomes purely the cost of time, or the cost of pure finance. Pure debt creation is less constrained than real wealth creation; it takes only the agreement of the two parties to postpone a due debt for additional interest. Consequently, growth of debt tends to exceed that of the real

economy. With compounded interest, debt services grow much faster than real income, and will take an increasingly dominant share of it. For example, debt services in 2003 took more than 80% of exports of Lebanon, 63% for Burundi, and in 2001 it was 82% for Sierra Leon (World Bank, 2005). Thus the real sector will be servicing the financial sector, instead of the other way around. The economy obviously cannot normally continue to grow, since interest-based debt, if not checked, threatens to absorb economic wealth through its unlimited growing services.

The devastating consequences of interest-based debt make it necessary to regulate financing from the beginning to avoid uncontrollable results. Islamic principles therefore make finance an inseparable part of real activities. That is why there is no "pure financing" instrument in Sharīʿah. Islamic instruments have debt finance as an integrated component of real transactions, as in deferred sale and *salam*. As long as debt is integrated with real activities, there is no issue in taking its costs into account. Such costs are controlled by real transactions, and thus debt cannot grow on its own.

This points to the difference between interest on lending and mark-up in credit sale. Interest is a self-replicating mechanism that makes debt grow and multiply independent of the real economy. As mentioned above, this eventually drains real resources, obviously to the benefit of lenders. Mark-up, on the other hand, is time value integrated into the real transaction. This eliminates the possibility of self-replication of debt. Time value as such is not the issue; rather it is the growth of debt independent of real wealth that threatens social

welfare. By integrating time value with real transactions, this replicating mechanism is eliminated.

The difference between integrated and separated debt is very much like the difference between a normal and a cancerous cell. A cancerous cell grows and multiplies in a disorderly and uncontrollable way. It escapes the control mechanism that keeps cells growing in their normal and orderly way (Buckman, 1997, p. 9). When debt evades control mechanisms, it grows on its own, just as cancerous cells do. The control mechanism is what keeps cells synchronized and integrated to perform normal body functions. Islamic regulations of debt represent the necessary control mechanism that keeps debt synchronized with the real economy. Interest makes debt evade control, and thus become a threat to the economy.

Principle of Integration

Both *ribā* and *gharar* work to sever subjective preferences from objective wealth. *Ribā* applies to time, while *gharar* applies to risk. Time and risk, as pointed out earlier, are in fact two sides of the same coin. Separating one implies separating the other. It is not surprising therefore that Sharīʿah prohibits both.

The separation of time and risk from real activities leads to divergence of the financial sector from the real sector. However, the separation is inconsistent with the nature of economic relations, and thus is not sustainable. This makes it increasingly costly to keep the two sectors apart. The rising costs of separation defeat its original purpose, namely efficiency and reduced transaction costs. Eventually,

the real sector will pay much more for separation than it costs to keep the two sectors integrated. Sharīᶜah, therefore, insists on the integration between two sectors to achieve balanced and sustained economic growth. This is an essential principle in developing Islamic financial products.

Integration and Specialization

Integration can be seen as a constraint on economic behavior, but it is a productive constraint. As already pointed out by Elster (2000), not all constraints are inefficient. North (1990) explains how institutional constraints help reduce transaction and informational costs. Specialization, which drives economic progress, as economists recognized long time ago, is a sort of self-constraints to improve productivity and discipline activities. Integration builds upon specialization at the input level to synchronize the output of various sectors. As Milgrom and Roberts (1992) point out, "specialization requires coordination" (p. 25).

Advocates of derivatives argue that separation of risk from underlying assets makes it more efficient to manage risk, since it is a form of specialization and division of labor. But risk is a purely mental construct, as discussed earlier, and thus cannot actually exist outside human mind. Separation of risk therefore is an *abstraction* from reality rather than specialization. While specialization naturally imposes greater discipline on economic behavior, abstraction by design lifts most boundaries and constraints that arise from the complexity of reality. Since abstraction is not sustainable, the real sector eventually

pays most of the costs of the undisciplined behavior resulting from abstraction. It is therefore necessary to assure the integration of the real and financial sectors from the beginning to avoid serious problems of coordination failure.

Evaluation of Financial Products

A direct implication of the principle of integration is that money-for-money instruments are unacceptable if performed for profit. An acceptable transaction therefore must incorporate a real component, e.g. goods, utilities or services. Although the real component is necessary for integration, it is not sufficient. In some cases goods are used only for artificial integration. Legitimate contracts involving real goods or services might be used in a manner that defeats the purpose of integration; namely to create real value. It is quite possible to combine acceptable contracts such that the final result is unacceptable. This is called *ḥila* (artifice) or *ḥiyal* (artifices). In artifices to circumvent usury, for example, real components are used for the purpose of lending. Real goods therefore are used to obtain financing, instead of financing used to facilitate real objectives.

The problem of artifices arises from the tension between substance and form of financial arrangements. Which side has the precedence over the other and when, determines the solution. It is useful to note, however, that this problem is not confined to Islamic jurisprudence. We already noted that the same problem arose in the late nineteenth century in the West with respect to futures and options. It arises now with respect to over-the-counter derivatives, as well as

accounting rules pertaining to such derivatives. Manipulation in both domains is common, as reflected in Enron and similar scandals (e.g. Partnoy, 2003). The manipulation hinges on the tension between the letter and the spirit of the law, between form and substance of the financial product. What makes Islamic jurisprudence different, however, is its moral dimension. The intention of evading the commands of Allah (*s.w.t*) is considered a major sin, regardless of whether or not it could be proven in court.

There are theoretically two extremes with respect to the relation between form and substance: to consider either form only, or substance only, and ignore the other. Both are Islamically not acceptable. As Ibn Taymiah [1] clearly shows, *ḥiyal* were unanimously condemned by the companions of the Prophet, peace be upon him. Ibn al-Qayyim [6] therefore reports that no prominent Muslim scholar endorses all kinds of artifices. This implies that form or means cannot have an absolute precedence over substance or ends. On the other hand, all scholars agree that good intentions are not enough to approve a certain transaction. This means that ends do not justify means. Accordingly, neither of the two extremes is acceptable, nor in fact practical.

This implies that scholars generally agree that there must be a balance or consistency between form and substance. Thus, differences among scholars in this regard can be attributed to differences in determining the degree of consistency, not regarding consistency in principle. This leads to the next principle of Islamic financial engineering:

Principle of Consistency

This principle states that form and substance of Islamic products must be consistent with each other; i.e. form should serve substance, and means should conform to ends. This principle relies on generally acceptable *fiqh* maxims, like "actions are based on objectives," and "meanings supersede litters" (e.g. Ibn al-Qayyim [6]). Accordingly, evaluation of a product should go through the following steps (Figure 10):

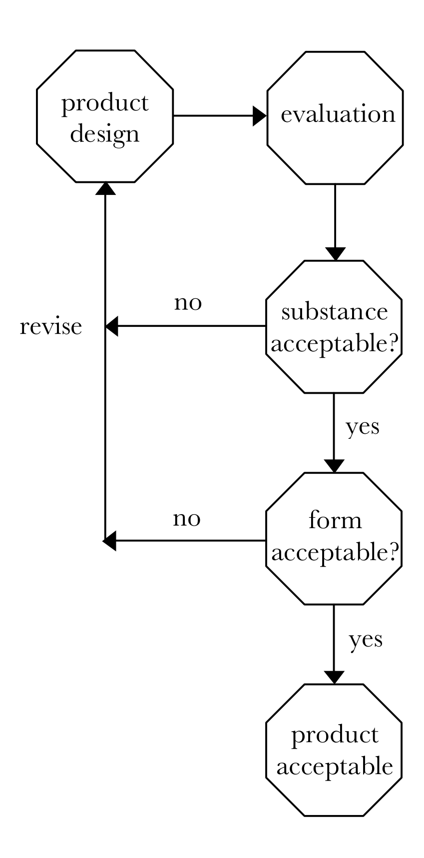


Figure 10: Process of Product Evaluation

1. Evaluate the substance or the end result of the product. If acceptable, go to step 2. Otherwise, go to step 3.
2. Evaluate the form of the product. If acceptable, the product is acceptable. Otherwise, go to step 3.
3. Revise the product, and then go to step 1.

Note that we start with substance, and then move to form. Both are necessary for final approval of the product. Neither one, however, is sufficient alone for full approval.

To give an example, consider two contemporary financial products: *murābaḥa* and *ᶜeinah*, including organized *tawarruq*. Both are used for financing, but *murābaḥa* requires the financier (bank) to purchase the good the customer requests, then sell it to the customer for a profit on deferred-payment basis. In *tawarruq*, the financier sells to the customer a good for a deferred price, then sells it again on the customer's behalf for cash, and deposits the money in the customer's account.

In terms of substance, the objective of *murābaḥa* is to provide the good the customer needs for a deferred price. The final result therefore is a normal sale. The objective of *tawarruq*, on the other hand, is to provide liquidity. The customer eventually gets cash in exchange for a debt of a larger magnitude. It therefore ends in pure debt financing. Obviously, in terms of substance, *murābaḥa* serves a legitimate objective, but *tawarruq* serves simply the same objective of *ribā*. Not surprisingly, therefore, *murābaḥa* is widely accepted, while

organized *tawarruq* is highly controversial (the Fiqh Academy in Mecca in fact rejected the latter in its ruling in 2003).

Given that the objective of *murābaḥa* is legitimate, we have to be sure it is implemented properly. The process must observe the detailed Sharīᶜah rules, like avoiding selling of what you don't have or making profit without being liable to the underlying good. Once these rules are observed, the instrument is acceptable since it passes through both stages of evaluation. For *tawarruq* or *ᶜeinah*, it will not help if all detailed rules were observed, since the final result is not legitimate.

A good example to further clarify this point is to compare pork with lamb or beef. Pork is positively prohibited by the Qur'ān, no matter how the pig was killed, whether slaughtered properly or not. The means are not relevant if the end itself is prohibited. Lamb, in contrast, is good in itself, so it has to be slaughtered properly to be completely acceptable. Obviously, not all animals are sheep, nor all are pigs. But it is certainly possible that people would differ whether a certain animal is a pig or a sheep. This would be normally tolerated, as it is only humane to differ. Thus, in many instances we can view differences of scholars regarding some artifices as differences regarding the type of "animal" rather than how it was processed.

Strategies for Product Development

The next step in Islamic financial engineering is to examine strategies and techniques for developing financial products. There are generally three strategies, depending on the starting point of the development process:

1. To start from conventional products.
2. To start from Islamic products.
3. To start from the real needs of customers.

Imitation

The first strategy is to have a conventional (but Islamically questionable) product as a reference, and then use Islamic contracts to construct an equivalent product with almost identical properties. The strategy is also called "reverse engineering" (Iqbal, 1999). Examples include:

- Replicating a conventional loan with interest through *tawarruq* or *ᶜeinah*.
- Time deposits are replicated through reversed *tawarruq*.
- A financial call option is replicated through *ᶜurbūn*.
- Interest rate swap is replicated through reciprocal *tawarruq* and reversed *tawarruq*, with different markup structures, and so forth.

This strategy is probably the easiest for developing products, since the target is already determined. This probably explains why it has been used for centuries. Imitation might help particularly in early stages of development of the Islamic industry, but its drawbacks could affect the long term pace of the industry. The main drawbacks are:

1. First, the strategy gives persistent precedence of form over substance, and means over ends. Application of Islamic rules becomes

a matter of passive and visionless observance of Sharīᶜah with little confidence in its economic value.

2. The strategy makes the Islamic industry by design a follower of the conventional industry. Since it is based on replication and imitation, conventional industry will always be the leader. This contradicts the essence of creativity and innovation, and thus the strategy cannot belong to financial engineering in its true sense.

3. Since imitation implies the same objective of conventional instruments, but with the additional constraints of Sharīᶜah rulings, it follows that Islamic instruments will always be inferior to conventional ones. This is a well known result in optimization theory where a binding constraint cannot improve the value of the objective function. This inferiority arises because of taking the conventional product as the objective function. The more natural approach is to take Sharīᶜah rules as given constraints, then derive an objective function for which the solution is optimal. That is, we should start from Sharīᶜah rules then arrive at the objective function, rather than going in the opposite direction.

4. Conventional instruments are developed to solve the problems of the conventional industry. Replicating these products will make Islamic institutions susceptible to the same problems for which these products were developed to solve. In other words, the strategy will bring in new and alien problems to the industry. As these problems get transmitted, the need for conventional products becomes stronger. This in turn necessitates replicating more products, which

adds more problems, and so on. The circle becomes self-feeding and the industry risks loosing its identity in the process.

It should be noted that in a healthy competitive market, imitation will lose its edge and its returns will diminish rapidly. The strategy therefore is not sustainable.

Mutation

The second strategy is to start from acceptable Islamic products, and try different variations and modifications on them, and see how the resulting products could be used. Using the jargon of *genetic algorithms* (GA), existing products will be subjected to mutations and cross-over, then using a selection criterion based on degree of integration, for example, superior products are retained and poor ones are dropped. The process is repeated until further improvements become minimal. Genetic algorithms are used for a wide range of applications, and can be effective in evolving desirable solutions for which traditional techniques fail (see for example Mitchell, 1998; Holland, 1995; and Goldberg, 1989).

The strategy could generate effectively infinite number of products. Given that the starting point is acceptable products, and based on the principle of acceptability, a substantial part of evolved products would be acceptable. This shows that the space of Islamic products is very rich and open.

This strategy deserves a full study on its own, but we will try to apply it in a primitive, non-genetic form, in the next section.

Satisfaction

The third strategy starts from actual needs of customers, then go back and see which products or designs could serve these needs. The strategy works in the opposite direction of the previous strategy, and therefore the two complement each other.

Choosing the real needs for developing products is the natural process of market evolution. Customers to a large extent determine the direction of the industry. Economic progress in fact can be measured by the ability of agents to satisfy their needs. Products, whether financial or physical, are means to satisfy such needs. This is another example of how in reality ends determine means, not the other way around.

An example of this strategy applies to lending. Consider a consumer who approaches the bank seeking a loan. He asks for cash money. But this is not his actual need, since he must use this money in another real transaction to satisfy his actual need. For example, he might use it to purchase an appliance or renew his furniture. Thus the real need is the final good, not the initial cash. For Islamic banks, this means that the bank should finance the ultimate good needed by the customer. If this is difficult for logistic reasons, advanced technology could greatly eliminate these obstacles, meanwhile improves the profitability of the bank.

If the customer needs the money to pay an existing debt, the same process could be applied to the creditor. The creditor, again, must use the money for real purposes. The bank should be ready to finance the creditor's needs using the customer's money. Money is a

veil, as Classical economists long time ago argued. This means that real transactions are the ultimate objective of economic transactions. With the advancement of technology and electronic money (e.g. Shiller, 2003, pp. 73-75), we are approaching the "cashless society" where money becomes a transparent layer revealing real transactions behind. Not only this improves the integration of financial and real sectors, it also makes financing more efficient with less transaction costs, meanwhile closer to Sharīʿah principles. Instead of taking cash then using it for real transactions, the real transaction is directly financed without the middle step. This shows that Islamic finance is potentially more efficient than conventional finance (see al-Jarhi, 2002). In other words, financing real transactions of customers is the ultimate alternative for lending and *tawarruq* products alike.

Conclusion

This section outlined some principles and strategies of Islamic financial engineering. The argument is that credible Islamic instruments are likely to be more efficient than conventional ones. The Islamic industry however needs to review applied strategies for product development to take full advantage of such efficiency. The following section attempts to apply the above framework for developing hedging strategies for Islamic instruments.

VII

ISLAMIC INSTRUMENTS FOR HEDGING

The term "hedging" is commonly used to mean minimizing exposure to risk. Although "hedging" differs from "insurance" (e.g. Bodie and Merton, 1998, pp. 224-225), we will take the term in its broad meaning. Risk, in any case, cannot be eliminated from economic activities. It is now a common view that financial intermediation is about managing risk, rather than avoiding risk (e.g. Heffernan, 1996, p. 163). And investors are well aware of the first rule of the game: "nothing ventured, nothing gained" (Bernstein, 1996, p. 256). Thus hedging effectively means managing risk, rather than eliminating it.

As discussed earlier, the challenge is to use hedging instruments that can achieve the benefits of risk distribution but do not lend themselves to gambling. That is, these instruments shall be integrated with real, value-adding activities, and may not be "neutral" with respect to gambling.

There is more than one approach to hedging. Three possible strategies are outlined:

1. Economic hedging
2. Cooperative hedging
3. Contractual hedging

Economic Hedging

This strategy stems from the decision maker and needs no explicit arrangements with other agents to achieve desired hedging. The most obvious and oldest example is to diversify investments. According to Bernstein (1996): "Investors diversify their investments, because diversification is their best weapon against variance of return" (p. 252). Diversification is an essential hedging strategy that stands alone as well as complements other strategies.

It might appear however that diversification hinders specialization. By definition, specialization requires concentration and focus of capital and labor. To the extent that the two strategies interfere with each other, it is a trade off decision. However, specialization can compensate for diversification through integrating the output with complementary products to minimize risk of loss (Ashkenas et. al., 2002, p. 7). In other words, integration at the output level may compensate for loss of diversification at the input level. Further, investors in a company specializing in a certain market can diversify its risks through holding a portfolio of diversified shares. Investors therefore are better able to diversify risks than companies, as Milgrom and Roberts (1992) point out. Thus, specialization at the firm level can be compensated through diversification at investors level (*op.cit.*, p. 587).

Alignment of Assets and Liabilities

An important source of risk is the asymmetry between revenues and costs, or assets and liabilities. This asymmetry exposes

the business to liquidity risks when due payments on the liabilities side are mismatched with those on the assets side. Further, firms are exposed to market risks when production is not well aligned with demand, causing risks of loss due to quick price changes and demand shifts.

Real business firms are continuously seeking technologies and strategies to align their revenues and costs. The Japanese "just-in-time" production, "direct-to-customer" sales strategy of Dell Computers, and efficient supply systems of Wal-Mart, all are examples (Evans and Wurster, 2000). Firms are networking with their suppliers and customers to create "virtual integration" of the supply chain, making it more flexible and responsive to market changes with less frictions and minimum costs (Kelley, 1994, pp. 187-189; Ashkenas et. al., 2002).

Financial firms, in contrast, tend to have persistent misalignments between their assets and liabilities. Borrowing short and lending long is the core business of banks. Insurance companies likewise have imbalanced sheet structure, with huge contingent liabilities and minor certain assets. Although it opens some profit opportunities, mismatching creates dangerous risks to the industry as well as the economy. The creation of central banks and deposit insurance, although attenuated systemic consequences, contributed to the persistence of the problem.

Derivatives play an important role in shifting some of the risks of misaligned balance sheets, and this might help explain their increasing growth. As these risks are transferred to other players, firms

find it more profitable to further misalign their balance sheets, leading to additional use of derivatives, an so on.

From an Islamic point of view, it is well known that Islamic banks are supposed to enjoy much more symmetric and aligned balance sheets, and thus much more stable structure (Khan and Mirakhor, 1987). That is, alignment of the balance sheet appears as an essential property of the Islamic system. The use of derivatives by Islamic institutions therefore is inconsistent with the nature of their structure, and would make them experience the same problems of the conventional industry, as pointed out in the last section.

Natural Hedge

Aligning assets and liabilities to reduce interest rate or currency risks is called "natural hedge" (Steinherr, 2000, pp. 29, 289). The exposure to a risk factor thus is offset by an opposite exposure to that factor (riskinstitute.ch; 3.2006). Balance sheet hedge is done by altering asset and/or liability repricing characteristics or volumes to reduce the firm's interest rate risk exposure without purchasing derivative instruments like interest rate swaps or futures (americanbanker.com; 3.2006). An exporter with a USD liability may use an expected USD income stream from future exports to hedge the currency risk associated with the USD liability (stats.govt.nz; 3.2006). Companies use natural hedging to avoid costs of derivatives hedging. According to Goldman Sachs, hedging $500 million worth of earnings cost $26 million (Sparks, 2000). Many companies instead revert to natural hedging to avoid currency risks.

Heffernan (1996) provides another example of reducing risks through matching assets and liabilities. A global bank working with multiple currencies can reduce its currency risk through "multicurrency-based share capital;" that is, to denominate its share capital in multiple currencies. An example is the Scandinavian Bank Group, which reconstituted its Sterling capital in four currencies: US Dollar, Swiss Franc, Deutsche Mark, and Sterling. If share capital is denominated in a mixture of currencies to match the volume of business assets and liabilities, then capital ratios will not change by much during exchange rate fluctuations. Accordingly, "currency risk is reduced without using hedging instruments" (p. 194).

Dynamic Hedging

Dynamic hedging refers to trading strategies that can replicate the payoff of a given derivative using only the underlying security. Assuming complete markets and frictionless world, an investor may be able to find a portfolio that pays the same payoff as the derivative pays at maturity without any payment except the initial investment. The portfolio is called a replicating portfolio, and the derivative must worth the same as the replicating portfolio. If it is not, then there is an arbitrage opportunity (Slutz, 2004). This is also called "delta-hedging." According to MIT Laboratory for Financial Engineering, "delta-hedging strategies are recipes for replicating the payoff of a complex security by sophisticated dynamic trading of simpler securities" (lfe.mit.edu; 12.2005).

This strategy is used for pricing derivatives, as was pioneered by Merton (1973) for option pricing. However, perfect replication is impossible with incomplete markets and transaction costs. Bertsimas et. al. (2001) solve for the problem of optimal replication in incomplete markets. They use stochastic dynamic programming to construct a self-financing dynamic portfolio strategy involving only the fundamental securities that most closely approximate the payoff of the derivative based on mean-square error.

This means that dynamic strategies can be used to replicate derivatives without actually buying any. Synthetic derivatives (e.g. synthetic options) can be constructed instead of actually buying options. Although they are not perfect substitutes, the approximation can be close enough to satisfy the needs of investors who prefer not to deal with derivatives. Many writers, however, have pointed to possible instabilities that dynamic hedging might cause to markets (e.g. Steinherr, 2000). This should be taken into account in evaluating such strategies.

Cooperative Hedging

Cooperative behavior is not residual to economic life. It forms an essential framework for social interactions, as discussed in the previous section. Accordingly, many important economic problems can be effectively solved through cooperation rather than for-profit arrangements, particularly problems of risk sharing and distribution. According to Shiller (2003, p. 93), reciprocity is necessary for risk

sharing and management, particularly when such behavioral concept is lacking today.

Although commercial insurance is widely adopted, mutual insurance is also common. About half of life insurance policies in the U.S. are issued by mutual insurance (Hansmann, 1996). Cooperative insurance enjoys the risk sharing and distribution of commercial insurance, but can reduce problems of moral hazard and conflict of interests that accompany it. Further, available evidence indicates that mutual structure might be more stable than stock-ownership structures. According to Gowland (1994), 60% of shareholder-owned saving & loans thrifts were facing imminent failure during the S&L debacle in late eighties, while only 25% of mutually owned were in the same category (Heffernan, 1996, p. 294).

From an Islamic point of view, commercial insurance is a *gharar* contract, and thus is not acceptable. Cooperative insurance, in contrast, is a non-profit arrangement, and thus can be accepted despite the large uncertainties involved. The main difference between the two, from an Islamic point of view, is the liability of the insurance company. A commercial (stock-owned) insurance company is obligated to pay the claims regardless of the size of available funds from subscriptions. Cooperative insurance on the other hand is limited by the size of available funds: If funds are not sufficient then either policy holders would voluntarily contribute the deficit, or the compensation will be reduced in proportion to available funds (al-Dharir [12], p. 641; al-Suwailem [9]). This not-for-profit and limited-liability structure enhances incentives to monitor and discipline

members to avoid exploiting the system, and thus problems of moral hazard are also reduced. Further, since derivatives' main drawback is the unproductive speculation they invite in, mutual hedging eliminates speculation by excluding profits. It becomes an arrangement between hedgers only, not between hedgers and speculators, as derivatives are. This brings in the benefits of risk distribution without creating additional risks that drain real resources and endanger the stability of the system.

Through cooperative arrangements, therefore, Muslim investors and Islamic institutions can join to share risks they are facing. Since it is not-for-profit, the arrangements are quite flexible and can accommodate any type of risk.

Cooperative Hedging for Currency Risks

Cooperative hedging is an effective strategy for currency risks for a simple reason: Sharīʿah imposes strong restrictions on currency for-profit trading that makes conventional hedging nearly impossible. Accordingly, the most suitable risk management strategy for currency risks is through cooperative, not-for-profit techniques.

One way to do so is for Islamic institutions to establish a cooperative fund to distribute and share currency risks. Members who own this fund must have different risk profiles in order to diversify their risks efficiently. Each member will perform his operations normally, but would credit any gains or losses of currency exchange to his account with the fund. Surpluses are kept as reserves to cover future deficits. Initial deficits are covered from initial capital provided

by members. To the extent that members' risks are uncorrelated, gains and losses will be canceled out, and members will be able to hedge their currency risks. Detailed structure of the fund could be designed according to members' preferences, but the basic property is being a cooperative structure; i.e. all risks of the fund are ultimately borne by members. This achieves risk sharing in its purist form, without the negative consequences of speculative trading. Other non-cooperative techniques for hedging currency risks are presented later in this section.

Bilateral Mutual Adjustment

Since cooperative structures are not for-profit, there is no minimum of the number of members involved. Although a large number of participants would help diversify the risks, the absence of such condition makes it very flexible in cases where not many agents might be involved in.

This feature can be used to design bilateral risk sharing between the financier and the customer in ordinary Islamic finance. Consider a customer who purchases an asset through a long-term arrangement. The financier faces risks of changing rates of return, and would like to hedge against it. If it is a lease contract, the two parties may agree to renew the contract by mutual consent periodically (say bi-annually), where the new rent will reflect prevailing prices. But suppose it was a *murābaḥa*, where the price is debt and therefore cannot be increased. How can the two parties arrange a bilateral hedge?

One way to handle it is as follows. If the rate of return rises, the customer would pay a higher installment, in exchange for reducing his balance accordingly. That is, by paying a higher installment the customer is speeding up the payment of his debt, and thus shortening the duration of the contract. For the financier, he is getting more cash and thus can utilize it at the higher rate of return. If the rate of return declines, the customer would pay lower installments but with a longer period of payment. The financier gives up some of the liquidity, but secures predictable future payments. In any case total debt is fixed and does not increase in any manner. What changes is the amount of the installment and, consequently, the maturity date. In other words, variability of the rate of return is reflected in variability of the duration of the contract. No additional payments beyond those specified in the contract are made. Since this change is made with mutual consent *at the time the rate changes*, no disputable uncertainty exists in the contract. No party gets something for nothing. Higher installments provide liquidity to the financier but reduce the duration of the payment. Lower installments provide liquidity to the customer but extend the duration of the payment. The arrangement therefore balances rights and obligations of each party in a cooperative manner.

Contractual Hedging

This strategy focuses on contractual, for-profit, instruments. As discussed before, risk management for-profit tools in Islamic finance are inseparable from real activities. Thus a single instrument would provide finance, risk management as well as ownership together. We

shall review the main Islamic instruments and see how can they be modified to accommodate risk distribution. The approach taken here is based on strategies of *mutation* and *satisfaction* discussed in the previous section.

Muḍārabah

The most ancient form of business financing is *muḍārabah*, where the capital owner (*rab-ul-māl*) provides capital and the agent (*muḍārib*) would utilize it in business projects. Profits then are shared based on predetermined ratios. There are mainly three types of risks involved. These are:

1. Risk of misreporting
2. Risk of loss
3. Risk of liquidity

Since *muḍārabah* represents a real investment, there is no significant liquidity risk from Sharīʿah point of view.

Misreporting Risk

This is the most common risk related to *muḍārabah*, where the agent might announce losses, when in fact the project is making profit. By misreporting the agent would keep the entire profits to himself. According to a survey by Khalil et. al. (2002), misreporting is the prime reason Islamic banks are not applying *muḍārabah* on the asset side of their balance sheets.

Although *muḍārabah* is a sharing arrangement, nothing could prevent banks from due diligence and careful examination of companies requesting finance. In fact, the current practice of conventional lending requires banks to extensively study the balance sheet and income statement of loan applicants, in addition to management and ownership. The bank will not provide the loan unless it is sufficiently confident the borrower is able to pay back from its own generated revenues. Banks therefore are only one step away from sharing the borrower's income. Islamic banks should apply the same level of due diligence for applicants of *muḍārabah*, or even higher, since they are exposed to downside risk. This means that, in equilibrium, Islamic banks would finance better businesses, and achieve higher success rate, than those financed through debt (al-Suwailem, 2005*b*).

In some cases, however, it is the customer who might refuse sharing financing, since he prefers to keep all the upside to himself and not share it with the bank. This should not be an obstacle, since the two parties can agree to share profits on a regressive scale, i.e. rates that decline with increasing profits. This may satisfy the customer preferences without sacrificing the benefits of sharing.

Credit-based Muḍārabah

For small businesses or single deals, the bank can apply what might be roughly described as "credit-based *muḍārabah.*" That is, the bank will not provide capital except after the transaction or the deal is closed. This is based on the Ḥanbali view that *muḍārabah* essentially is

a labor contract, and thus capital or money needs not be paid upfront. It becomes effectively a form of *wujūh* partnership, also accepted by the Ḥanbali as well as the Ḥanafi schools (Ibn Qudamah [5]). Accordingly, the bank would sign a *muḍārabah* agreement with the customer, have him arrange the deal with related parties, then share realized profits. For example, the agent or *muḍārib* would purchase material on short-term credit basis with the right to cancel in 48 hours, say. Then he sells the material to the purchaser for a profit. The agent then would present receipts of purchase and sale to the bank, upon which the bank would pay the seller, receive the purchase price from the purchaser, then pay the agent's share in profits as agreed. If the last deal for any reason is canceled, the first could be canceled also. In this manner the bank pays only if the deal is closed, and thus risks of failure and misreporting are brought to minimum.

Capital Risk

In *muḍārabah*, as well as most forms of partnership or *mushārakah*, investors face downside risk, i.e. risk of losing their capital. Due diligence and conditional payment can greatly minimize these risks, as discussed above. Other alternatives may also be useful.

One alternative is to combine a deferred sale with partnership. For example, the financier, instead of providing money to the company, would sell required inputs, say, in return for a deferred price plus a defined share of the company's assets. This allows the financier to hedge the downside meanwhile share in the upside.

To see the logic of this combination, recall that in a deferred sale the seller charges a fixed markup for deferring the payment. If the seller is allowed to secure a fixed and determined profit through the markup, then having the profit conditioned on the performance of the purchaser seems more acceptable, since it makes the seller partly shares the risks the purchaser faces.

Note that this formula is equivalent to a deferred sale with variable return. The variable return, however, is not linked to LIBOR or a similar interest rate reference. Rather, it is linked to actual profits of the customer. This relieves the customer from interest burden, and at the same time allows the bank to enjoy better returns. There is no conflict of interest between the two, since the bank gets higher returns only if the customer does. More on this point later.

Third Party Hedging

Another way to hedge the downside risk is through a third party. This works as follows. The investor or financier provides money to the company through partnership or *mushārakah*, by which the financier becomes a (passive) shareholder in the company. The investor subsequently can sell all or part of his share to a third party. For example, the investor may sell a portion, say 95%, of his share for a deferred price that is equal to his capital, and keeps the remaining 5%. The remaining share allows the investor to participate in the company's profits, while the deferred price protects his investment.

The third party (say an Islamic insurance company) enjoys the participation in the company without advanced payment, and with

relatively low markup cost. What is more important is that the company doesn't bear any burden of debt at all. From the company's point of view, the investment is still a form of *mushārakah*. Thus the arrangement allows all parties to gain.

Deferred-price Sale

Sale with deferred price, or *bay*[c] *ājil*, is very common in Islamic finance. The main risks of deferred sale are:

1. Credit risk
2. Liquidity risk
3. Rate of return risk

Credit risk can be treated mostly the same way conventional credit risk is. The bank can take collaterals and guarantees to protect its investment. For late or delayed payment, it wouldn't help much to charge the customer and add to his outstanding debt. The reason is simple: If the customer is not able or not willing to pay, say, 1000, he will be even less inclined to pay 1200. Charges will give the customer fewer incentives to repay. The direct solution, applied successfully in some well known Islamic banks, is to have direct access to the customer's income. The bank therefore will be able to deduct the amount due directly on time. The delinquency rate of on such bank is less than 0.3%, or 3 in 1000, without late charge fees of any kind.

Liquidity Risk

Since the deferred price is a monetary debt, it is not acceptable from Sharīᶜah point of view to sell it for cash. This means that, for long-term debts, the bank might face liquidity risks, i.e. may not be able to liquidate these debts or securitize them. There are at least two solutions to this problem. One is to exchange debt for commodities instead of cash. That is, the bank may use existing debt to pay for assets or commodities the bank want to finance through *murābaḥa*. The debt will be discounted appropriately, but this raises no difficulties. Exchanging debt for commodity (*dayn bi ᶜayn*) is acceptable according to the Māliki school as well as Ibn Taymiah (al-Dharir [12]).

The second solution is to combine monetary debt with real assets into one portfolio, with debts not exceeding 50%, and then securitize the portfolio. Contemporary scholars view this as acceptable since the majority of the portfolio consists of real assets that can be traded for cash. Additional solutions are discussed below.

Rate of Return Risk

As pointed out earlier, since the deferred price is debt, it cannot be increased after the sale is concluded. This means that to have a floating rate on a deferred sale is incompatible with Sharīᶜah maxims. For long-term debt, this exposes both parties to risk of changing rate of return or markup rate. Since this is a legitimate need, we are confident that there exist solutions that successfully meet Sharīᶜah requirements.

We have already pointed to one cooperative solution. Variability of rate of return can be reflected in variability of duration of the contract through changing the installment amount. If market rate rises, the two parties mutually agree to raise the installment amount, and thus shorten the duration. Conversely, if the market rate declines, the two agree to reduce the installment and consequently extend the duration. Although this does not change the explicit return on the debt, it provides liquidity to the affected party, which can compensate for lost return. This solution is cooperative since the adjustment has to be made with mutual consent at the time of change. This shall not pose a problem, however, since no party gets something for nothing, as discussed before. Thus, the arrangement is incentive-compatible and therefore it is time-consistent. This makes it in the interest of the two parties ex post to agree on the change.

Diversified Deferred Price

A more general solution is a diversified deferred price (al-Suwailem, 2005*a*). Consider a *murābaḥa* to a corporate or sovereign entity with payment duration of, say, 20 years, and annual rate of 5.2%. This means that the markup equals 51% of the total payment, while the principal represents 49%. Instead of having the entire debt in monetary terms, the mark up could up be in any agreed upon real asset. It could be a defined amount of commodities, shares, fund units, *ṣukūk*, or any mix of these. This structure provides the following benefits to the financier:

First, the deferred price is liquid, since 51% of it is in real assets, and thus can be traded for cash. Hence it can be securitized or issued in form of *ṣukūk*.

Second, prices of the real assets allow the financier indirectly to get returns linked to the market. Higher market returns will be reflected in higher prices, and vice versa. This might be more valuable than a floating rate, since the floating rate cannot compensate deterioration in the price currency. For example, based on the US Dollar index of New York Board of Trade, the Dollar lost about 20% of its value since September 11, 2001. Further, the DJ commodity index for example has appreciated in the same period by more than 60% (Figure 11). A floating rate on a Dollar-denominated debt would have not recovered this lost value, especially with declining interest rates on the Dollar. With diversified debt, much of the lost value could have been recovered.

For the debtor, the diversified price would relieve his debt obligations if the real component closely matches his sources of revenues. For example, an oil company or oil-exporting country might choose oil as the main markup asset. A more diversified entity might choose a more diversified basket of commodities. This means that the debtor faces less risk than if the markup was predetermined, or was linked to rates independent of his revenues.

In fact, the choice of real assets instead of floating interest rates could help both parties for a macroeconomic reason. It is well known that interest rate and economic output are negatively correlated. Thus

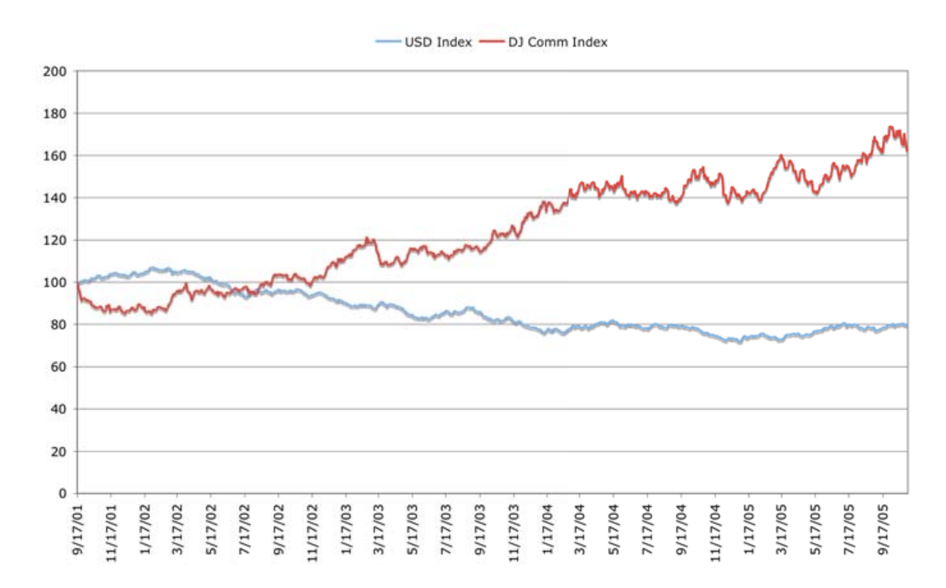


Figure 11: USD Index and DJ Commodities Index
Source: nybot.com and djindexes.com

a rise in interest rate implies lower economic performance, and vise versa. An interest-linked debt therefore will generate higher returns to the creditor exactly when economic conditions are unfavorable to the borrower. Conversely, when the borrower is making good returns because of an economic boom, the lender is getting low returns because of low interest. This conflict of interest is absent if the price is diversified through real assets.

Commodity-linked Bonds

The diversified structure is somewhat close to "commodity-linked bonds." These bonds are structured so that their coupon and/or principal payments are determined by the price of some commodity (Dodd, 2005). Among the early references to the idea are

Lessard (1986) and Besley and Powell (1989). The idea has been implement in late nineteenth and early twentieth centuries (Borensztein et. al., 2004). According to researchers at the IMF, commodity-linked bonds if issued by governments serve to prevent or reduce debt crisis, promote international risk sharing, and facilitate adjustment of fiscal variables to domestic economic conditions (Borensztein et. al., 2004). Atta-Mensah (2004) from Bank of Canada argues that commodity-linked bonds provide commodity-producing countries an opportunity to hedge against fluctuations in their export earnings.

Commodity-linked bonds differ from diversified price *ṣukūk* in that bonds pay money in exchange for money, while a diversified price pays in kind and money in exchange for a good. Yet both instruments work to relieve the borrower from interest burden, and thus provide risk-sharing features. A related instrument is *salam*, which will be discussed shortly.

Currency Risk in Murābaḥa

Currency risk can be part of capital risk, and diversification shall provide an indirect hedge against currency fluctuations. Alternatively, one simple way to hedge currency risk in *murābaḥa* is to have it transferred to the counterparty. If the counterparty is a conventional entity, it may resort to conventional instruments. For example, if an Islamic bank provides *murābaḥa* to a customer in Euro, but capital is in USD, the customer (debtor) shall pay in USD instead of Euro. The customer obviously may not take that risk, so it might

arrange a forward with its own bank, such that the conventional bank issues a payment guarantee to the Islamic bank in USD. Costs of such arrangements can be included in the overall pricing of the deal. If the customer is an Islamic entity that may not use forwards, then the deal can be done through "parallel *murābaḥa*": the Islamic bank sells to the customer's bank in USD, which in turn sells to the customer in Euro. This intermediate *murābaḥa* can be performed by a conventional as well as an Islamic entity, as long as it is willing to take the risk. The point is that currency risks can be hedged *within* the *murābaḥa* transaction, not separately. This is consistent with the overall approach to integrate risk management with real activities, as discussed earlier. This allows for risk management to be part of value-adding transactions, which allows for hedging meanwhile curbs speculation.

Value-based Salam

Salam has been known much before the time of the Prophet, peace be upon him. The advancement of payment in exchange for a specified quantity of a defined good provides financing to the seller as well as price discount to the buyer. The main problem with *salam* is the price value of the good at maturity. This price might be much different from the expected price, and the gap might wipe out the benefits of the advanced payment. Price fluctuations were an instrumental factor behind the emergence of futures markets. From an Islamic point of view, futures are inconsistent with Sharīᶜah maxims, and thus cannot be an adequate solution to the problem.

There are many ways to address price fluctuations, but one solution deserves careful analysis. It is called “value-based *salam*” (al-Suwailem, 2005*a*). It works as follows. The buyer pays in advance the full price, say 10,000, in exchange for oil, for example. Traditionally, the quantity of the oil shall be determined upfront, i.e. number of barrels to be delivered at maturity. In value-based *salam*, the *value* rather than the quantity shall be determined upfront. Value is defined as quantity times unit price, or number of barrels times barrel’s price. Let the value agreed upon is 11,000. This means that the buyer pays 10,000 for an amount of oil the value of which at maturity is 11,000. At maturity, the barrel’s price is determined from the market, and thus the quantity becomes also determined (by dividing the value by the barrel’s price). So if the barrel’s price at maturity is, say, 50, then the quantity of oil to be delivered is 220 barrels.

This form of *salam* has been approved by Ibn Taymiah, and his opinion was cited by Ibn Mufliḥ, a prominent Ḥanbali scholar, without objection (al-Rajhi [13]). The buyer in this arrangement is able to hedge against price fluctuations of the future good. If the price at maturity declines, quantity to be delivered will rise to compensate for the price reduction. If the price rises, the quantity declines. Thus price fluctuations are internalized through the value determined at the outset.

Discussion

Value-based *salam*, however, may be questioned on Sharīʿah grounds, for two reasons:

1. It violates the classical conditions of *salam*, whereby the quantity of the good must be specified upfront.
2. It is essentially money for money, which makes it an indirect form of *ribā*.

These two objections can be answered as follows:

1. The condition on the quantity to be known aims at eliminating the possibility of dispute. Once dispute is absent, the condition needs not be observed for its own sake. If the value is determined, no possibility of dispute arises, since all variables will be determined from the market.
2. The formula is not *ribā*, neither in form nor in substance. The net result of the transaction is money for goods, not money for money. The buyer at maturity receives goods not money. The fact that the value of these goods is pre-arranged doesn't make it objectionable. Not any more than *murābaḥa*, where the bank buys spot and sells deferred for a markup. Here the bank buys deferred and sells spot. So the two arrangements, *murābaḥa* and value-based *salam*, are essentially equivalent. The only difference is the sequence of steps.
3. It should be noted that value-based *salam* provides an opportunity for the two parties to gain from the transaction. To see this, suppose the seller in the previous example is an oil company. Although the market price at maturity is 50, the company most likely is able to obtain the oil at a lower price, either through long-term relations in the industry or through

its own reserves. So if it costs the company, say, 30 per barrel, this means that total *actual* cost for the company is 6,600, which is less than the total price it received. That is, the company is able to save 3,400, while the buyer is able to make 1,000. Both parties therefore win. This could not happen in a pure loan, since the two sides of the loan are identical by design. Here the two sides are different, and this difference allows the two parties to gain.

4. Value-based *salam* differs from artifices of *ribā*, like *tawarruq* and *ᶜeinah*, in an important dimension. In these artifices, the same commodity could be used successively, by the same agent or by others, to generate additional debts without limit. There exists no upper bound on how many times the commodity is sold for deferred price then resold for cash. A single commodity therefore could in a very short period generate huge debts, as it is actually observed. In *salam*, including value-based *salam*, this is impossible, since the moment the commodity is delivered debt is extinguished. That is, at any given point in time, a single commodity cannot generate debt that exceeds its value plus the markup. The instrument self-regulates the amount of generated debt and internally imposes an upper bound on its possible size. This is consistent with the nature of Islamic finance in the absence of artifices, since all debts are used to finance real transactions. Consequently, possible debt size is bounded by real activities. This is in

contrast to interest-based economy, where debt can grow indefinitely, irrespective of the size of the real economy.

Liquidity of Salam

Value-based *salam* could neutralize the price risk. But what about liquidity risk, especially for long-term contracts? The majority of scholars argue that *salam* cannot be traded because it is a form of sale before possession. The Māliki school accepts trading *salam* debt as long as the sold good is not food or other essential commodity. Ibn Taymiah accepts trading *salam* for a price not greater than the initial price, to avoid making profits without assuming liability.

However, parallel *salam* can be used as an alternative. The buyer may sell a new *salam* contract with the same characteristics of the original one. The difference is that he is now liable for the new *salam*. If the original seller fails to deliver, the buyer (new seller) has to deliver. The liability of *salam* traders in this structure is similar to that of negotiable instruments. The law requires traders of these instruments to be liable if the originator did not perform, unless it is stated to be "without recourse" (e.g. West's Encyclopedia, 1998). This shouldn't be a problem if the creditworthiness of the original seller was sound. With large number of traders trading small fractions of the good, the risk becomes reasonably tolerated.

Rate of Return Risk

Value-based *salam* may allow for capital protection, as *murābaḥa* does, but it does not allow for market-linked, variable return. To allow for this option, we need to adopt a similar structure to that of diversified *murābaḥa*. The deferred good now consists of two components:

1. Value-based component to minimize capital losses.
2. Quantity-based component to allow for market return.

That is, the classical form of *salam* is useful in exposing investors to market return. However, the downside is hedged through the value-based form. This "hybrid *salam*" therefore manages both capital risk as well as return risk. Liquidity risk is managed through parallel *salam*.

Other Applications of Value-based Salam

Value-based *salam* has been suggested as a suitable instrument for equity issuance. In corporate finance, there are theories of how firms decide on their capital structure in terms of equity or debt. One widely accepted theory, "picking order theory," is built on the assumption of informational asymmetry between managers and outside investors. If outside investors are less informed than inside managers, then issuing equity might send a bad signal about the firm. Investors suspect that the firm's existing assets are overvalued and thus managers are trying to exploit this by issuing new equity with overvalued price. Accordingly, issuing equity puts downward pressure on share prices. To avoid negative signals of overvalued assets, Stewart

Myers (2001), professor of finance at MIT, suggests that firms issue "deferred equity" based on value (p. 95). If inside information is likely to be revealed in, say, one-year time, then the firm can issue an unspecified number of equities for a fixed price of, say, $1000, such that a year later investors get a number of shares equal $1000 divided by the share price prevailing at that time. This instrument avoids the informational problems of issuing equity since no specific valuation is given to equity at time of issuance, and by the time of maturity inside information could be revealed. This shows that value-based *salam* has intrinsic economic value and not merely an artifice for pure financing.

The instrument can also be used to create a "local currency." According to Gates (1998, pp. 155-156), in 1990 some communities in the US issued a local "dollars" redeemable in food. That is, the local dollars are issued in exchange for a specific number of US dollars, and can be redeemed six months later, say, for food with same value. These local dollars then started to circulate given the confidence in the issuer. This helped the community overcome the problem of limited sources of financing by creating their own "currency." Again, this shows the richness of value-based *salam* and its wide range of applicability.

Payoff Structure of Contractual Hedging

The above instruments have in common a payoff structure similar to that of mixed-sum games. They allow for win-win outcomes, but also imply the possibility of a zero-sum, win-lose, outcome. For example, in value-based *salam* and diversified *murābaḥa*, the debtor

might not be able to obtain the commodities at reasonable costs. Similarly, when combining deferred sale with sharing the debtor might fail to generate profits and thus becomes a loser. As already discussed, mixed games are acceptable as long as the positive outcome is the objective of the game.

This structure combines risk transfer with mutual gain, while derivatives in contrast perform pure risk transfer with no room for mutual gain. This means that Islamic instruments provide the benefits of risk transfer without the costs of conflict of interests and relative behavior. Further, derivatives shift risks to those who are more *willing* to bear them, but not necessarily those who are better *able* to manage them. Islamic instruments, in contrast, are likely to shift risks to those more willing *and* more able to bear them. This follows from the objective of the game which is mutual gain, whereby the two parties seek to create value not merely to trade risk. Accordingly, risk is likely to be transferred to those who are better able to contribute to value-creation, not merely to bear risk. This implies better ability to manage such risks in a more productive manner.

Specialized Institutions for Risk Management

The above discussion also points to the need for specialized Islamic institutions for managing risk. Third party hedging, for example, requires such an entity. Mutual hedging of currencies and other risks is another. The entity performing intermediate *murābaḥa* for currency hedging is a third example. While Islamic insurance

companies represent a step in that direction, the traditional insurance business falls short of comprehensive investment risk management.

We have argued earlier that risk shall be integrated with real transactions, and this might appear inconsistent with the call for specialized institutions. There is no contradiction in fact between the two, since such institutions would still manage risk in an integrated approach, as suggested in third party hedging. Further, mutual hedging requires devoted institutions for managing such mutual arrangements. Thus, the need for specialized institutions arise from the general need for professional Islamic risk management, be it based on for-profit or non-profit techniques.

Summary

Table 2 summarizes suggested Islamic instruments for hedging. Other examples are provided in al-Suwailem [10]. Overall, there is no limit on risk management tools based on Sharīʿah standards. The general principle of mutual gain and win-win payoff structure is sufficient to generate a variety of instruments that allow for risk transfer without conflict of interest and systemic instability. The above examples point to how the strategy works; otherwise, each instrument deserves independent research whereby detailed structure and conditions are laid down in order to satisfy the specific needs of Islamic institutions.

Table 2: Islamic Hedging Instruments

No	Instrument	Risks Hedged
1	Asset-liability alignment	General
2	Delta-hedging	General
3	Mutual hedging	General
4	Natural hedge	Currency, rate of return
5	Bilateral mutual adjustment	Rate of return
6	Credit-based *muḏārabah*	Capital, misreporting
7	*Mushārakah* & deferred sale	Capital, rate of return
8	Third party hedging	Capital, rate of return
9	Diversified deferred price	Capital, return, liquidity
10	Parallel *murābaḥa*	Currency
11	Value-based hybrid *salam*	Capital, return, liquidity

VIII

CONCLUSION

Risk is a challenge, for Islamic as well as conventional finance. Despite all ingenious techniques invented for risk management, global markets are becoming increasingly volatile, and financial crises appear more frequently and more severely. As we have seen, conventional risk instruments raise concerns about systemic instability, in addition to legal and moral issues. These instruments can be used for both hedging and gambling, as Kenneth Arrow points out, and no guarantee exists they are directed for productive uses. In reality, however, statistics show clearly that they are used for speculation and gambling-like activities much more than for hedging.

Specialists agree that risk can be managed but not eliminated from economic activities. "Nothing ventured, nothing gained" is the first maxim in the business world. Economic progress cannot be achieved without assuming risk. Entrepreneurial spirit is the driving force of prosperity, and thus risk-taking is an essential moral value.

The challenge therefore is to be able to distinguish these two opposite ends, and find instruments that selectively serve valuable risk management but discourage gambling and unproductive behavior. As it has become clear, human mind, left to its own, falls short of solving

this dilemma. The Divine guidance, however, points to the right path to the solution. Teachings of the Qur'ān and Prophet Muhammad, peace be upon him, provide the necessary framework for finding the answer to this age-old challenge. At the heart of this framework is the integration of risk management and value-creation. This integration improves economic efficiency while it opens the door for unlimited creativity.

The paper is an attempt to outline this framework together with practical examples. Suggested instruments cover wide range of risks, including capital risk, liquidity risk, rate of return risk, as well as currency risk. Major Islamic modes of finance, i.e. *muḍārabah*, *mushārakah*, *murābaḥa*, and *salam*, are discussed, and how related risks can be managed. The discussion shows how Sharīᶜah is abundant with genuine solutions that integrate risk management with value-creation. These examples and instruments however are by no means conclusive or final, but hopefully point to directions for fruitful and rewarding future research.

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﴿ وَآخِرُ دَعْوَاهُمْ أَنِ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ ﴾

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ABOUT THE BOOK

The last decade witnessed an increasing trend in markets' volatilities and financial crises. During the same period, derivatives, the most common instruments for hedging, have been growing at an exponential rate. Apparently, derivatives did not help to stabilize markets and attenuate financial crises. This is not difficult to explain, since derivatives are also the main instruments for speculation. More than 97% of derivatives are used for speculation, while less than 3% are used for hedging. The challenge therefore is to search for instruments that allow for productive risk management without harmful speculation. This is the theme of Islamic finance that the paper explores. Based on Shari'ah rules of *gharar*, the paper therefore suggests several instruments for managing and hedging risks associated with Islamic modes of finance.

Topics